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MAR 9 1917

FLORA

OF THE PRAIRIE PROVINCES

Bernard Boivin

Part III

(continued)

NEW YORK
BOTANICAL GARDE

113. COMPOSITAE

(COMPOSITE FAMILY)

Floret lacking an involucre and typically with 5 anthers fused into a ring around the style. The bulk of the species with flowers in heads belong in this family.

- a. Heads radiate.
 - b. Pappus of capillary bristles.....Group I
 - bb. Pappus lacking or different, of awns, chaff, scales or minute bristles.....Group II
- aa. Florets all ligulate or all tubular.
 - c. Heads discoid.....Group III
 - cc. Florets all ligulateGroup IV

Group I

Heads normally with a ring of ligulate flowers. Central flowers all tubular. Casuals sports may be double or discoid. Species that are normally discoid are also included in Group III. Pappus of numerous fine bristles usually at least as long as the achene.

- a. Ligules white, pink, blue or purple.....Group 1-A
- aa. YellowGroup 1-B

Group 1-A

Ligules not yellow.

- a. Annual with a taproot.....14. Machaeranthera p. 126
- aa. With a rhizome or caudex, rarely perennial with a taproot.
 - b. Tegules narrow and numerous, all of the same length or a few of the outer ones much shorter.....15. Erigeron p. 127
 - bb. Broader and unequal, usually imbricated and the outer gradually shorter, sometimes the outer larger than the inner and ± foliaceous.

- c. Ligules coloured and/or the inflorescence not corymbiform.
 - d. Stemless.....12. Townsendia p.108
 - dd. Stem present.
 - e. Heads many or rarely single and small.....13. Aster p. 109
 - ee. With a single large head.
 - f. Disk 2-3 cm across when dried; perennial from a taproot..... 12. Townsendia p. 108
 - ff. Somewhat narrower; perennial from a branched caudex..... 13. Aster p. 109
 - cc. Flowers white; heads in a corymb.
 - g. Pappus of dimegueth bristles, the outer about 1 mm long..... 13. Aster p. 109
 - gg. Much longer and isomegueth..... 8. Solidago p. 98

Group 1-B

Ligules and florets yellow.

- a. Leaves opposite..... 47. Arnica p. 177
- aa. Leaves alternate or all basal.
 - b. Monocephalous plants.
 - c. Tegules of uniform length..15. Erigeron p. 127
 - cc. Imbricated, the outer gradually shorter..... 9. Haplopappus p. 106
 - bb. Heads normally numerous.
 - d. Tegules nearly all of the same length, a few of the outer ones many times shorter..... 48. Senecio p. 183
 - dd. Much imbricated.
 - e. Perennial from a rhizome or caudex.....8. Solidago p. 98
 - ee. Taprooted perennials.
 - f. Pappus bristles dimegueth, the outer much shorter..... 7. Chrysopsis p. 98
 - ff. Bristles of uneven length but not sorted out in two series..... 9. Haplopappus p. 106

Group II

As in Group I but the pappus not of bristles, sometimes lacking, or of scales, or awns, or chaff, the latter often setaceous-tipped.

- a. Ligules not yellow, mostly white, but often coloured..... Group-II-A
- aa. Ligules yellow.

- b. Receptacle chaffy or bristly..... Group-II-B
- bb. Receptacle naked..... Group-II-C

Group II-A

Radiate in white, pink or purple, not in yellow.

- a. Leaves opposite33. Galinsoga p. 161
- aa. Alternate or all basal.
 - b. Leaves entire or nearly so.
 - c. Rays 2 cm long or more...26. Echinacea p. 154
 - cc. Much shorter.
 - d. Stemless or monocephalous..... 12. Townsendia p. 108
 - dd. Stem present; heads numerous..... 11. Boltonia p. 108
 - bb. Dentate to much dissected.
 - e. Closely or coarsely dentate.
 - f. Ligules deep red brown..... 39. Gaillardia p. 164
 - ff. White.
 - g. Ligules ± 1 mm long 41. Achillea p. 165
 - gg. Larger, 3-5 cm long..... 43. Chrysanthemum p. 169
 - ee. Finely and repeatedly dissected.
 - h. Ligules 3 mm long or less..... 41. Achillea p. 165
 - hh. Larger, 4-20 mm long.
 - i. Receptacle naked... ..42. Matricaria p. 167
 - ii. Each floret subtended by a bractlet (= chaff)... .. 40. Anthemis p. 165

Group II-B

Heads radiate in yellow and the receptacle chaffy or bristly, that is with the tubular florets individually subtended by bractlets or bristles.

- a. Leaves opposite, becoming alternate in the inflorescence.
 - b. Rays formed by the larger inner
tegules..... 32. Bidens p. 160
- bb. Rays formed by the prolongation of
the corolla of the peripheral flowers.
 - c. Leaves narrowly pinnatifid to
bipinnatifid..... 30. Coreopsis p. 159
 - cc. Entire to coarsely lobed.
 - d. Head center much higher than
wide; receptacle conical; peri-
pheral florets fertile 24. Heliopsis p. 152

- dd. Head not so high; receptacle
flattish; peripheral florets
sterile 29. Helianthus p. 155
- aa. Leaves alternate.
 - e. Ligules bicolour, deep red-brown towards
the base..... 39. Gaillardia p. 164
 - ee. Yellow.
 - f. Head cylindric with 4-5 drooping
ligules 27. Ratibida p. 154
 - ff. Head shorter and the rays much more
numerous.
 - g. Leaves mainly basal, the cauline
ones only 1-3 and much reduce ...
..... 28. Balsamorhiza p. 154
 - gg. Stem quite leafy.
 - h. Leaves narrowly dissected ...
..... 40. Anthemis p. 165
 - hh. Entire to dentate.
 - i. Disk flattish to somewhat
convex..... 29. Helianthus p. 155
 - ii. Hemispheric to oblong
and very protuberent..
..... 25. Rudbeckia p. 153

Group II-C

Heads radiate in yellow; receptacle naked, i.e.
neither chaffy nor bristly.

- a. Leaves opposite 36. Bahia p. 163
- aa. Alternate or basal.
 - b. Leaves all basal or remotely pectinati-
partite 37. Hymenoxys p. 163
 - bb. Stem leafy, the leaves entire or less
narrowly divided, dentate to pinnatifid
with broad lobes.
 - c. Somewhat shrubby at base; heads small
and numerous 6. Gutierrezia p. 98
 - cc. Stem herbaceous to the base; heads
larger or longer.
 - d. Heads rather inconspicuous, the
rays only about 2 mm long and only
1-3 per head..... 34. Madia p. 162
 - dd. Ligules more numerous and much
longer.
 - e. Heads very sticky; tegules
strongly squarrose.....
..... 5. Grindelia p. 97
 - ee. Tegules neither sticky nor
squarrose.
 - f. Ligules cuneate, coarsely
trilobed at summit
..... 38. Helenium p. 164

- ff. Ligulate or slightly wider near the middle and finely 3-toothed at summit 49. Calendula p. 192

Group III

Heads discoid.

- a. Leaves and/or heads spiny or catchy by hooked prickles Group III-A
- aa. Not spiny.
 - b. Leaves opposite or verticillate Group III-B
 - bb. Alternate.
 - c. Various special types: semishrubby, or the heads all or mostly in terminal racemes, or the heads globular with the outer florets pendant .. Group III-C
 - cc. More run-of-the-mill types.
 - d. Pappus of capillary bristles .Group III-D
 - dd. Lacking or chaffy Group III-E

Group III-A

Tegules and/or leaf lobes ending in stiff sharp spines or with hooked tips.

- a. Head catchy, the tegules ending into spines hooked at tip.
 - b. Fruits axillary23. Xanthium p. 151
 - bb. Heads terminal 51. Arctium p. 193
- aa. Spines not hooked but stiff and sharp at tip.
 - c. Only the heads spiny.
 - d. Heads all terminal and spiny 56. Centaurea p. 200
 - dd. Some heads axillary and spiny 22. Ambrosia p. 150
 - cc. The leaves also spiny-lobed.
 - e. Pappus plumose 54. Cirsium p. 196
 - ee. Barbellate or glabrous.
 - f. Barbellate; tegules gradually tapered from base to tip 53. Carduus p. 195
 - ff. Pappus bristles glabrous; tegules constricted towards the middle 55. Silybum p. 200

Group III-B

Leaves opposite or verticillate.

- a. Achene devoid of pappus.
 - b. Head with an involucre very different from the leaves 21. Iva p. 149

- bb. No involucre, but the head subtended by a few foliaceous leaves 16. Psilocarphus p. 139
- aa. Pappus present.
 - c. Pappus of 2-(4) terminal awns or horns.
 - d. Inner tegules connate, about twice as long as the outer.. 31. Thelesperma p. 160
 - dd. Free and petaloid or shorter than the outer 32. Bidens p. 160
- cc. Pappus of capillary bristles.
 - e. Leaves becoming alternate in the inflorescence 3. Brickelia p. 96
- ee. All opposite.
 - f. Florets yellow 47. Arnica p. 171
 - ff. White or purplish ... 2. Eupatorium p. 94

Group III-C

Various unusual types.

- a. Heads globose, terminal on very long peduncles 50. Echinops p. 193
- aa. More numerous and in racemes or panicles.
 - b. Inflorescence a raceme; herbaceous plants.
 - c. With a taproot or corm; heads purple 4. Liatris p. 96
 - cc. Stoloniferous; heads white 17. Antennaria p. 139
- bb. Heads paniculate; shrubby at base.
 - d. Leaves opposite, heads white 3. Brickelia p. 96
 - dd. Leaves alternate and narrow, heads yellow.
 - e. Leaves spinulose-serrate 14. Machaeranthera p. 126
- ee. Entire 10. Chrysothamnus p. 108

Group III-D

Not spiny; heads discoid; leaves alternate; pappus of capillary bristles.

- a. Corollas yellow 48. Senecio p. 183
- aa. Not yellow, but white, pink, etc.
 - b. Pappus plumose 52. Saussurea p. 194
- bb. Barbellate or glabrous.
 - c. Stem leaves reduced to large foliaceous petioles; normal leaves large and all basal 46. Petasites p. 175
- cc. Stem with normal leaves.
 - d. Herbage copiously white-wooly; leaves entire.

- e. Flowers all perfect; taprooted herbs 19. Gnaphalium p.148
- ee. Some flowers staminate only; mostly with stolons or a rhizome.
 - f. Flowers dioecious 17. Antennaria p.139
 - ff. Central florets staminate, the peripheral pistillate 18. Anaphalis p.147
- dd. Pubescence different; leaves mostly dentate.
 - g. Pappus, like the corollas, purplish 1. Vernonia p. 94
 - gg. Pappus white to tawny.
 - h. Tegules narrow, numerous and long-tapered, all of the same length or a few of the outer ones many times shorter 15. Erigeron p.127
 - hh. Tegules uneven, the outer much longer or more commonly imbricated in gradually shorter rings.
 - i. Tegule tips flabellately enlarged, or flabellately lobed to pectinatifid, or flabellately spiny 56. Centaurea p.200
 - ii. Tegule tips entire and not enlarged.
 - j. Fibrous-rooted and usually stoloniferous.. 13. Aster p.109
 - jj. Tatrooted; not stoloniferous 14. Machaeranthera p.126

Group III-E

As III-D but the pappus lacking or chaffy.

- a. Main leaves opposite 21. Iva p.149
- aa. Alternate.
 - b. Leaves entire to coarsely toothed.
 - c. Leaves large, deltoid-ovate 20. Adenocaulon p.149
 - cc. Smaller and narrower, elliptic to linear.
 - d. Involucral bracts in one series and uniform in length 34. Madia p.162
 - dd. In many series and the outer ones successively shorter.

- e. Receptacle bristly; heads few,
large and mostly terminating
elongated branches.....
..... 56. Centaurea p. 200
- ee. Receptacle naked; heads many
and small, on pedicels often
shorter than the heads.
f. Leaves closely and finely
crenate..43. Chrysanthemum p. 169
- ff. Entire or with a few rather
coarse and remote teeth or
lobes..... 45. Artemisia p. 171
- bb. More dissected, narrowly pinnatifid to
tripinnatifid.
g. Pappus of scales \pm 1 mm long; leaves
narrowly pectinatifid
..... 35. Hymenopappus p. 162
- gg. No pappus.
h. Inflorescence paniculate to
spiciform..... 45. Artemisia p. 171
- hh. Inflorescence not so elongate but
corymbiform.
i. Annual; receptacle conical
..... 42. Matricaria p. 167
- ii. Perennial; receptacle flattish
to slightly raised towards the
middle 44. Tanacetum p. 170

Group IV

Flowers all ligulate. Stem and leaves commonly with
a milky juice.

- a. Scapose Group IV-A
- aa. Stem \pm leafy.
b. Pappus of minute scales.
c. Flowers blue 57. Cichorium p. 201
- cc. Yellow 58. Lapsana p. 202
- bb. Pappus of bristles.
d. Bristles plumose Group IV-B
- dd. Merely barbellate or scabrous Group IV-C

Group IV-A

Scapose herbs. Head solitary and borne directly
on the rhizome, the peduncle naked or merely with small
bracts, not leafy. Florets all ligulate.

- a. Achene beakless.
b. Leaves tomentose-ciliate; achene about 8 mm
long 59. Microseris p. 202

- bb. Leaves not ciliate or at least not tomentose-ciliate; achene much smaller. 72. Hieracium p. 214
- aa. Pappus borne at the end of a long beak.
 - c. Pappus bristles plumose; receptacle chaffy 61. Hypochaeris p. 203
 - cc. Bristles smooth or slightly scabrous; receptacle not chaffy.
 - d. Achene becoming spinulose-muricate towards the tip 65. Taraxacum p. 205
 - dd. Achene uniformly tuberculate on the ridges 69. Agoseris p. 210

Group IV-B

Stem leafy. Otherwise as IV-A. Pappus of branched (i.e. plumose) bristles.

- a. Ligules pink 63. Stephanomeria p. 204
- aa. Yellow or sometimes orange to deep red.
 - b. Involucre not calyculate, the tegules isomegueth 64. Tragopogon p. 204
 - bb. Tegules dissimilar, the outer ones many times shorter or much broader.
 - c. Leaves all basal or near basal ..
..... 61. Hypochaeris p. 203
 - cc. Stem leafy to the inflorescence ..
..... 62. Picris p. 203

Group IV-C

Pappus of simple and smooth or scabrous bristles.

- a. Pappus double, the outer 5 units small and scale-like, the inner bristle-like 60. Krigia p. 203
- aa. Pappus of bristles only.
 - b. Achene compressed, at least twice as broad as thick.
 - c. Seed without beak or disk
..... 66. Sonchus p. 206
 - cc. Pappus borne on a disk at the end of a ± obvious beak... 67. Lactuca p. 207
 - bb. Achene terete or polygonal, little if at all compressed.
 - d. Ligules yellow or orange to deep red.
 - e. Herbage long-pilose at least in part 72. Hieracium p. 214
 - ee. Glabrous or the pubescence very short or farinose.
 - f. Stem leafy towards the base only 59. Microseris p. 202
 - ff. Leafy throughout or at least in the upper part.. 70. Crepis p. 211

dd. White or creamy or pink.

g. Florets 5, pink ... 68. Lygodesmia p. 209

gg. More numerous and usually white.

h. Inflorescence a panicle or
branched raceme

..... 71. Prenanthes p. 213

hh. Heads corymbose

..... 72. Hieracium p. 214

1. VERNONIA Schreber

IRON-WEED

Style branches filiform, short-hirsute on the
outer side only.

1. V. fasciculata Mx. var. corymbosa (Schwein.)
Schub. -- Numerous discoid heads with purplish florets,
pappus and tegule tips. Tufted virgate herb. Lanceo-
late leaves alternate, serrate. Heads numerous, mostly
corymbose. Tegules conspicuously imbricate. Second
half of summer. Along Rat and Red rivers at Otterburne
and Morris; rare. -- scMan, US.

Doubtfully reported from "Weyburn Prairie, Sask."
by Rydberg 1932, Russell 1937 & 1944 and Breitung 1957
on the basis of a collection by Sanson (NY). We share
Breitung's doubt and consider that the locality or the
label is almost surely incorrect. Not only is this spe-
cimen disjunct by 300 miles to the nearest locality of
the species, but it has never been confirmed and it is
also irregular on a phytogeographical basis as it belongs
to var. fasciculata and not to var. corymbosa as it could
be expected in the northwest corner of the range of the
species. For another doubtful Weyburn report see under
Desmodium canadense in Part IV.

2. EUPATORIUM

THOROUGHWORT

Style branches filiform like the above, but finely
puberulent all around. Leaves opposite or verticillate.

a. Leaves verticillate 1. E. purpureum
aa. Opposite 2. E. perfoliatum

1. E. purpureum L. var. maculatum (L.) Darl. (E.
maculatum L., var. Bruneri (Gray) Breit., var. foliosum
Fern.) -- Joe-Pye-Weed -- Tall herb with large verticil-
late leaves. Leaves lanceolate, serrate. Heads discoid,
pinkish purple, in a terminal corymb. Second half of
summer. Marshy and semi-open spots in galerie-forests.
-- NF-SPM, NS-S, BC, US -- F. Faxonii (Fern.) Boivin --
Flowers white. Local: Nipawin. -- NF, O, S, (US) -- F.
tegulosum Boivin -- Floral parts modified into so many
scales. Local anomaly: Otterburne -- se Man.

F. Faxonii (Fern.) stat. n., E. maculatum L. f. Faxonii Fern., Rhodora 47: 195. 1945.

F. tegulosum (Boivin) stat. n., E. maculatum L. f. tegulosum Boivin, Svensk Bot. Tidskr. 53: 431. 1959.

Plants with more densely pubescent herbage have been called var. Bruneri, but this may be only an ecological variant. Its greater frequency in the western part of the range is probably climatically conditioned.

The group of E. maculatum has had a checkered history and old records are not always readily interpreted. It started with Linnaeus as a group of three species: maculatum, purpureum and trifoliatum. By the time of the 1908 edition of the Gray's Manual these had been reduced to a single species and three varieties. But the pendulum has swung back and Barratt's 1841 classification was revived after being revised as to taxonomy by Wiegand 1920, amended as to nomenclature by Wiegand and Weatherby 1937. The proposed arrangements finally found their way into major eastern manuals with 4 species and one variety keyed out and described. We have always found this too complex arrangement unsatisfactory and others seem to have had the same trouble, judging from the many erratic identifications in the various herbaria visited. There is a general lack of morphological cleavage between the taxa and too much sympatry when the diagnostic criteria are applied rigorously. We have been able to recognize only two weak geographical varieties as follows.

The more eastern var. purpureum (= E. trifoliatum L.) has larger leaves, ovate-lanceolate, the main ones 4-8 cm wide and often 2 dm long or more; stem solid and purplish or speckled in purple; heads commonly pinkish, usually with 5-7 flowers each.

The widespread var. maculatum (= E. dubium W.; E. fistulosum Barratt) is more deeply coloured and its leaves are smaller by about half. Stem fistulose or solid, green or glaucous to purplish or purple-speckled. Main leaves mostly 2-4 cm wide and usually around 1 dm long. Heads darker in colour and bigger, usually with 8-12-(15) florets each.

Reports of var. maculatum from west of our area may possibly relate to introduced plants only. At any rate the only two B.C. collections we know, Lulu Island (DAO) and Chilliwack (CAN, DAO), seem to represent introductions.

2. E. perfoliatum L. -- Boneset, Thoroughwort (Herbe à souder) -- Leaves triangular-lanceolate and connate across their bases into perfoliate pairs. Leaves broadest at the base. Heads small, discoid and white in rounded terminal corymbs. Mid summer. Shores. -- NS-sMan, US.

Eupatorium rugosum Houtt. (E. urticifolium Reichard) was doubtfully reported from "Weyburn prairie, Sask." by Rydberg 1932, Russell 1937 & 1944 and Breitung 1957. The comment under Vernonia fasciculata seems equally applicable here. The habitat is quite wrong for an eastern forest species that would reach its limit of range some 400 miles further east. Nor is it likely that the specimens were collected in Manitoba as speculated by Breitung.

3. BRICKELIA Ell.

Like Eupatorium, with very long filiform styles, etc. Tegules strongly imbricate and strongly costate. Pappus bristles minutely barbellate.

1. B. grandiflora (Hooker) Nutt. -- Large white discoid heads somewhat drooping in terminal clusters. Leaves opposite, petiolate, deltoid-ovate or cordate, serrate, becoming alternate in the inflorescence. Tegules deep green, costate in white, the inner whitish at tip, the outer long caudate. Mid to late summer. Wet rocky places in the mountains: Waterton. -- swAlta, wUS, (CA).

The first Canadian collection was by Dawson in 1874 at the Kootenay Pass (MTMG) while surveying the 49th parallel. A provincially ambiguous location, it has led to the species being reported from both Alberta and B.C., but more modern collections would restrict its Canadian range to Waterton Park only. Indeed modern collecting indicates that a fair proportion of Dawson's specimens labelled Kootenay Pass probably came from within Waterton Park as defined to-day.

4. LIATRIS Schreber

BLAZING STAR

Like the last two, but the pappus plumose and the tegules not striate.

a. Heads hemispheric to subglobose... 1. L. ligulistylis
aa. Much narrower, cylindric 2. L. punctata

1. L. ligulistylis (Nelson) K. Schuman (L. aspera AA.; L. scariosa AA.) -- Showy and stiffly erect herb with a terminal raceme of a few large heads, the terminal one largest. Root a woody irregular and subglobose corm. Leaves lanceolate, the upper many times smaller. Heads purplish. Tegules tips concave, squarrose, erose, purplish and membranous-margined. Mid summer. Frequent in draws and around groves southward, in sandy woods northwards. --sMan-Alta, US --F. leucantha Shinnars -- Flowers white. Local. --Man-S, (US).

Two sheets of this species at MTMG deserve special mention. Both were collected in 1855 by Jas. Anderson. Both specimens look like twin brothers, the way specimens from the same collection do. But they carry widely different locality data: "Mackenzie River" on one case, the other: "Found on the plain of Saskatchewan and North". In view of the known distribution of L. ligulistylis, the locality data of the first specimen would seem to be erroneous and should presumably be changed to read like the second.

There are a number of other apparent range extensions among the Anderson specimens, mostly of prairie plants. But there are too many such extensions and quite a few appear improbable. We therefore have ignored them all unless confirmed by later collections and the localities given on his labels are considered to be generally questionable.

2. L. punctata Hooker var. punctata -- Taproot with a globular enlargement at some distance below the surface. Smaller than the last and the leaves linear and conspicuously scabrous-ciliate. Tegules ciliate, cuspidate. Mid summer. Frequent and showy on steppes and hillsides. -- Man-Alta, US -- F. albiflora (Sheldon) Boivin -- Flowers white. Scattered and very rare: Souris, Rockglen -- Man-S, US.

F. albiflora (Sheldon) stat. n., Laciniaria punctata (Hooker) Ktze. f. albiflora Sheldon, Quart. Bull. Univ. Minn. 1: 26. 1892; L. punctata Hooker f. albiflora Sheldon. nomen invalidum ex Scoggan, Fl. Man. 514. 1957; L. punctata Hooker. f. alba Horr & McGregor, Trans. Kansas Ac. Sc. 54: 216, 1951. The only U.S. collection seen of the white-flowered form was from Les Genoux, Montana (DAO).

Var. punctata is 0.5-4.0 dm high and its leaves are 3-5 mm wide. To the southeast it gives way to a var. nebraskana Gaiser, taller, 4-8 dm high, and with narrower and eciliate or barely ciliate leaves, 2-3 mm wide.

5. GRINDELIA W.

GUMWEED

Pappus of 2 or more deciduous awns. Heads large, radiate in yellow. Otherwise much as in Aster.

1. G. squarrosa (Pursh) Dunal var. squarrosa (var. quasiperennis Lunell, var. serrulata (Rydb.) Stey.; G. perennis Rydb.) -- Gumweed, Gumplant (Epinette de prairie) -- Very sticky heads, tangling readily by their very strongly squarrose tegules. Leaves serrate, resinous-punctate in darker green. Involucre very resinous. Mid to late summer. Somewhat saline soils, especially if disturbed. -- sMack, (NF), Q-BC, US.

Middle and upper stem leaves ovate to oblong-lanceolate and auriculate-clasping. The more western var.

integrifolia (Nutt.) stat. n., G. nana Nutt. var. integrifolia Nutt., Trans. Am. Phil. Soc. 7: 314. 1840, has narrower leaves, at least the middle and lower ones oblanceolate, long cuneate at base, sessile and neither auriculate nor clasping.

Other segregates listed as synonyms have the range of the species and appear to be part of the normal range of variation of the typical phase.

6. GUTIERREZIA Lag.

Similar to Solidago, though the pappus is of ciliate scales.

1. G. Sarothrae (Pursh) Britton & Rusby (G. diversifolia Greene) -- Broom-Weed -- Like a diminutive Solidago graminifolia. Tufted, semi-shrubby perennial with a taproot. Leaves linear, very narrow, scabrous. Heads somewhat glutinous. Late summer. Mainly eroded steppes and badlands. --Man-Alta, US, (CA).

7. CHRYSOPSIS Nutt.

GOLDEN ASTER

Like Solidago, with dimegueth pappus-bristles, the outer many times shorter.

1. C. villosa (Pursh) Nutt. (C. angustifolia Rydb.; C. hirsutissima Greene; C. hispida (Hooker) Nutt.) -- Like a yellow-flowered Aster. Tufted perennial, densely and stiffly pubescent throughout. Stem very long hirsute. Leaves oblanceolate, entire, very long ciliate towards the base. Tegules purple tipped. Summer. Common on light or disturbed soils. --Man-BC, US.

A rather variable type, often subdivided into many varieties or species. While we would hesitate to be too positive about extralimital segregates, within our area this species appears to form a single population, hence the consolidation.

8. SOLIDAGO L.

GOLDENROD

Like Aster, but the flowers yellow (white in two species). Heads rather small and the ligules short.

a. Stem leaves entire and long-linear; inflorescence corymbiform.

b. Ligules white..... 13. S. ptarmicoides

bb. Yellow; plants taller.

c. Leaves straight and flat, uniform

in length 14. S. graminifolia

cc. Conduplicate, falcate, larger and the upper many times shorter

..... 12. S. Riddellii

aa. Stem leaves serrate.

- d. Leaves fairly uniform in length, the upper at least half as long as the lower.
 - e. Leaves obovate to broadly oblanceolate, typically oblong..... 8. S. mollis
 - ee. Rather narrowly lanceolate.
 - f. Stem pubescent 9. S. canadensis
 - ff. Glabrous except in the inflorescence 10. S. gigantea
- dd. Upper stem leaves gradually shorter..... Group A

Group A

Leaves serrate and gradually shorter upwards, the lower ones at least twice as long as the upper.

- a. Leaves densely puberulent on both faces.
 - b. Heads in a rounded corymb..... 11. S. rigida
 - bb. In a panicle or a thyrses.
 - c. Heads in an elongated thyrses .. 1. S. bicolor
 - cc. In a panicle.
 - d. Panicle ± secund; middle leaves less than 1 cm wide and narrowly oblanceolate 7. S. nemoralis
 - dd. Not secund; middle stem leaves broader and tending to elliptic ..
 - 8. S. mollis
 - aa. Glabrous or merely ciliate.
 - e. Inflorescence broadly pyramidal, over 1 dm wide 6. S. juncea
 - ee. Narrower and often elongate.
 - f. Lower leaves long ciliate towards the base; heads rather few and large 2. S. multiradiata
 - ff. Leaves not ciliate or merely finely scabrous-margined.
 - g. Achene pubescent.
 - h. Tufted; heads glutinous ..
 - 3. S. spathulata
 - hh. Stoloniferous; not glutinous 5. S. missouriensis
 - gg. Achenes glabrous.
 - i. Lower leaves at least 2 cm wide and the petioles somewhat sheathing at base.... 4. S. uliginosa
 - ii. Usually much narrower and tapered to a narrow base ..
 - 5. S. missouriensis

1. S. bicolor L. var. bicolor. -- Silverrod, Silverweed -- Herbage hispid throughout. Perennial from a short rhizome. Inflorescence an elongated thyrses, cylindric or rarely narrowly paniculate. Ligules white

Tubular flowers tending to yellowish. Mid summer. Dry, semi-open places. --NS-Man, US -- var. concolor T. & G. (S. hispida Muhl., var. lanata (Hooker) Fern.) -- Ligules yellow when fresh, often fading or drying white. Green midnerve of the tegules tending to be narrower, narrowly oblanceolate, and more sharply contrasted with the larger paler and whitish margins. Dry open woods, frequent. --NF, NS, NB-S, US.

Var. concolor is commonly treated as a species (= S. hispida) but the difference amounts to only this single colour character, hence the rank of variety adopted here. The colour difference is quite obvious in the ligules when fresh, but there may be some fading in drying. In the tegules the colour is more variable and the difference is not susceptible of being sharply defined.

Var. lanata is an extreme of pubescence of sporadic occurrence.

2. S. multiradiata Aiton (var. scopulorum Gray S. scopulorum (Gray) Nelson) -- Heads rather large, the involucre (6)-7-(8) mm high, and not very numerous, mostly 10-20 per inflorescence. Puberulent in the inflorescence and the lower leaves long ciliate towards the base, otherwise glabrous. Stem leaves, especially the upper, tending to be oblong-oblanceolate. Thyrse rather short, sometimes merely round-corymbose, but usually a little bit taller and the lowest branch † drooping when fresh, tending to be a bit remote. Mid summer. Northern and montane or alpine meadows. --(F)-K-Aka, L-NF, NS, NB-BC, US.

3. S. spathulata DC. var. spathulata (var. nana (Gray) Cronq., var. neomexicana (Gray) Cronq.; S. decumbens Greene, var. oreophila (Rydb.) Fern.; S. oreophila Rydb.) -- Tegules glutinous, marking the paper in yellow in drying, remaining † shiny. Tufted, 1-5 dm high. Finely puberulent on the stem and in the inflorescence. Basal and lower leaves spathulate-oblanceolate. Inflorescence an elongate and cylindric thyrse. Mid summer. Common prairie species. --Mack-Aka, (NS), NB-O-(Man)-S-BC, US.

Often subdivided into a series of poorly defined and commonly intergrading varieties: the more common and more widely distributed type with narrower and more elongate leaves is var. neomexicana; smaller plants of higher altitudes are var. nana; here and there, especially in the mountains and closer to oceans or large bodies of water, one will find broader-leaved plants which may be termed var. spathulata westward or ssp. Randii (Porter) Cronq. in the east.

Around the Great Lakes there is a somewhat more clearly defined var. Gillmanii (Gray) Cronq., taller,

(4)-5-8-(10) dm high; leaves larger, the lower often up to 3-4 cm wide and more coarsely serrate; heads somewhat larger.

4. S. uliginosa Nutt. var. uliginosa (S. Purshii Porter; S. neglecta T. & G.; S. uniligulata (DC.) Porter) -- Lower leaves rather large, 1.5-3.0 dm long; including the sheathing petiole, and mostly 2-3 cm wide. Fairly tall, but less than 1 m high. Inflorescence elongate, a thyse or a very narrow panicle. Late summer. Bogs. -- seK, L-SPM, NS-seMan, US.

In younger and smaller plants the branches are at first more strongly ascending and the heads not obviously secund. This is sometimes distinguished as A. Purshii.

Around the Great Lakes one finds smaller plants with narrower leaves 1 cm wide or less. These may be segregated varietally as var. jejunifolia (Steele) Boivin.

5. S. missouriensis Nutt. var. missouriensis -- Long stoloniferous and common prairie species usually 2-4 dm high. Glabrous or somewhat puberulent in the inflorescence. Leaves narrowly oblanceolate, less than 1.0 dm long, all or mostly less than 1 cm wide, the lower often scabrous-margined. Inflorescence very variable, short and usually less than 5 cm wide, heads not strongly secund. Involucre 3-4 mm high. Mid summer. Common in prairies and open places. -- wO-sBC, US -- Var. extraria Gray -- Heads larger, the involucre 4-5 mm high. Rocky ridges in the mountains and foothill prairies. -- swAlta, wUS -- Var. fasciculata Holz. (S. glaberrima Martens) -- Larger throughout, the inflorescence up to 1 dm wide and broadly pyramidal. Lower leaves up to 1.5 dm long. Plant commonly 4-5 dm high. Lower branches recurved at tip and their numerous heads all or mostly borne on the upper side only. More common in lighter or disturbed soils. -- wO-Alta, US.

Our 3 varieties intergrade freely and the last is somewhat transitional to S. juncea.

6. S. juncea Aiton -- Similar to the last variety, but larger throughout. Loosely tufted. Basal leaves 1.5-3.0 dm long, mostly 2-3 cm wide and forming large and conspicuous rosettes. Glabrous throughout. Inflorescence broadly pyramidal, commonly 1.5-2.0 dm wide, the lower branches elongate, recurved and bearing numerous heads turned upwards. Mid summer. Dry semi-open places: Sandilands. -- NS-seMan, US.

7. S. nemoralis Aiton (var. decemflora (DC.) Fern.; S. pulcherrima Nelson) -- Inflorescence usually strongly secund and mostly facing southward on sunny days, with the tips strongly arching in the opposite direction. Herbage densely puberulent throughout and somewhat sca-

brous on the leaves, Loosely tufted and mostly 2-4 dm high. Leaves oblanceolate. Mid summer. Hillsides and dryer prairies. --wNS-eBC, US.

The more western plants are commonly segregated as a var. decemflora on the basis of narrower and less dentate leaves, of larger heads and sericeous achenes. Our specimens do not conform readily to this dichotomy.

8. S. mollis Bartl. -- Stem leaves numerous and commonly elliptic, varying from narrowly obovate to broadly oblanceolate and obtuse to rounded at tip. Upper leaves many times smaller. Lower leaves slightly shorter than the middle ones but usually deciduous. Commonly 3-4 dm high, long stoloniferous, without basal rosettes but with short sterile shoots. Herbage densely puberulent and scabrous. Leaves with 3 stronger and nearly parallel nerves. Inflorescence thyrsiform to paniculate. Second half of summer. Dryer prairies and steppes. --swMan-sAlta, US.

9. S. canadensis L. var. canadensis (var. fallax (Fern.) Beaudry, var. salebrosa (Piper) Jones; S. lepida AA., var. elongata (Nutt.) Fern.; var. fallax Fern.) -- Conspicuous virgate herb, often \pm 1 m high, with numerous small yellow heads. Long stoloniferous and without rosette but producing shorter sterile stems. Stem finely pubescent at least in the upper half, the hairs incurved. Leaves numerous, fairly uniform in length, mostly around 1 cm wide, narrowly lanceolate, with 3 much stronger nerves, \pm puberulent below, glabrous above to slightly puberulent, especially along the nerves. Inflorescence pyramidal. Mid summer. Open woods and moist meadows. -- Mack-(Y-Aka), L-NF, NS-BC, US -- Var. gilvocanescens Rydb. (S. dumetorum Lunell; S. gilvocanescens (Rydb.) Smyth; S. Lunellii Rydb.; S. pruinosa Greene) -- More pubescent, especially the leaves densely puberulent and scabrous above. Leaves often broader. Common in prairies. -- swMack, L-NF, NS, Q-BC, US. -- Var. scabra (Muhl.) T. & G. (S. altissima L.) -- Stem densely pubescent with longer, crisp-flexuous, and \pm spreading hairs, usually around 0.5 mm long. Leaves often similarly pilose, especially on the lower face. -- wNB-swQ-seMan, US.

It has been customary to restrict the application of S. canadensis to the plants with smaller heads, the involucre 2-3 mm high, its tegules mostly \pm 0.3 mm wide, and narrowly lanceolate leaves \pm 1 cm wide. Plants with larger heads and leaves have been distinguished as var. salebrosa, or var. fallax, or S. lepida, but the distinction does not appear to be a significant one in our area and we are dubious about its value elsewhere.

If the distinction is accepted, var. salebrosa may possibly be the correct name for the coarser plant, but,

as pointed out by Cronquist 1955, S. serotina Aiton var. minor Hooker 1834 could be an earlier and valid name. This name needs checking as to its exact meaning; unfortunately its type could not be located at K in 1969. A more recent var. fallax (Fern.) Beaudry, Nat. Can. 95: 37, 1968 has also been proposed for what appears to be essentially the same entity.

The use of S. lepida for our slightly larger-headed plants is erroneous. S. lepida DC. is a Pacific Coast species with a very narrow panicle of much fewer and much larger heads, the involucre 5-7 mm high.

9X. S. canadensis var. gilyocanescens X gigantea var. serotina -- With the broadly lanceolate leaves, about 2 cm wide, of either parent. Intermediate as to pubescence. Stem rather coarse as in S. gigantea, but puberulent towards the top as in S. canadensis. Some leaves glabrous below, some puberulent on the main nerves. Upper leaf surfaces partly or sparsely scabrous-puberulent. Heads rather large as in S. gigantea, the involucre 4mm high. Pincher Creek. --swAlta, (US).

10. S. gigantea Aiton var. serotina (Aiton) Cronq., (var. leiophylla Fern.; S. serotina Aiton) -- Closely resembling the last but larger and less pubescent. Stem coarser, mostly 1.0-1.5 m high. Glabrous except the inflorescence. Leaves rather lanceolate and commonly 2-3 cm wide, glabrous on both faces, scaberulous at margin. Heads tending to be large, the involucre commonly 3.5-4.0 mm high, the tegules often 0.5 mm wide or larger. Second half of summer. Mostly near watercourses and shores. --Mack, NS-eBC, US.

The more eastern var. gigantea is pubescent along the main nerves on the lower leaf surfaces, usually scabrous above. Old reports of the latter variety from Western North America are apparently to be discounted as pointed out by Cronquist 1955. The exact basis of Macoun's 1884 western report could not be readily determined; the original specimens are presumed to have been revised to other taxa. All western Canadian material found under var. gigantea at CAN, DAO and MT has been revised, mostly to var. serotina, but some also to S. canadensis and S. missouriensis.

11. S. rigida L. var. humilis Porter (var. canescens (Rydb.) Breitung; S. parvirigida Beaudry; Oligoneuron canescens Rydb.; O. rigidum AA.) -- Leaves conspicuously and pinnately veined, the lower leaves many times longer, oblong-lanceolate and long petiolate. Tufted, 2-7 dm high, with conspicuous rosettes 1.5-3.0 dm high. Herbage densely puberulent and somewhat scabrous. Inflorescence 3-10 cm wide, round-corymbose, its branches almost always ebracteate. Mid summer. Common on steppes. -- O-Alta, US.

Our variety is generally smaller and with fewer leaves, 5-23 per plant, the basal ones shorter. The more eastern var. rigida is (6) -10-(17) dm high; lower and basal leaves \pm lanceolate, 2.5-5.0 dm long including the petiole; stem leaves 20-30 per plant; inflorescence mostly larger, 7-16 cm wide, its lower branches more or less bracteolate in their lower half. We are keeping the two taxa at varietal rank because there is some degree of morphological overlap. Both varieties were reported (as species) from our area by Rydberg 1932 and Russell 1937, 1944 and 1954; but all western specimens examined, including duplicates of collection by Fraser (DAO) and by Russell (DAO), proved to be referable to var. humilis.

It was recently discovered that some specimens of var. rigida were tetraploid ($2n=36$) while others of var. humilis were diploid ($2n=18$). On that basis var. humilis was promptly elevated to specific rank as S. parvirigida. Such a procedure is considered to be unsound on two counts.

First it is an attempt to express the concepts of one speciality (genetics) in the terminology of another (taxonomy). This abuse of terminology can only create confusion for both specialities. That the geneticists have not yet provided themselves with their own naming procedures, as some other specialities have done (e.g. *cultivar*, *forma specialis*), may be a handicap to the geneticists, but it is not a justification to take over the terminology of taxonomy for genetic purposes.

The attempt at a take-over has gone quite far in some cases. Witness the following quote from a geneticist: "Plants which belong to different levels of ploidy are best considered, from a theoretical standpoint, as different species, even if they are morphologically identical, because the difference in the number of chromosomes constitutes a strong enough reproductive barrier to keep the populations separate under conditions of sympatry". -- Can. Journ. Gen. Cyt. 5: 167. 1963. -- Obviously the author of the quote would define the species in essentially chromosomal terms.

Second, it is based on a confusion between cause and effect. A species is first and foremost a discontinuous morphological unit. And the discontinuity implies the existence of a barrier to hybridization. Without such a barrier normal reproductive events would rapidly obliterate the discontinuity, and any taxonomic distinction would become impossible. However, the barrier itself, be it geographical or genetic or other, is not a taxonomic character in its own right, it is only the mechanism

that makes a morphological discontinuity eventually possible. And from this discontinuity arises the taxonomic character. The discovery of the exact nature of a barrier, or the discovery of an additional barrier -- a second level of ploidy in this case -- represents progress in our understanding of a taxon, but it is not the discovery of a new character and is not in itself a justification for changing the rank of said taxon. See also Boivin 1960.

Further it must be pointed out that in this particular case the ploidy levels exhibit only partial concordance with the morphology. Some specimens apparently quite typical of var. rigida proved to be now tetraploid (Beaudry 57-14-1 from Bloomfield, Mich.) now diploid (Beaudry 57-472 from Manchester, Tenn.). It is not uncommon to find more than one ploidy level within a species without corresponding morphological differentiation, or with only a weak differentiation, as in this case.

11X. S. Maheuxii Boivin -- Hybrid with S. Riddellii and generally similar to the latter, but the leaves are densely scabrous-puberulent and not quite so elongate. Inflorescence very broadly paniculate or round-corymbose. Rare: Kleefeld. --seMan.

12. S. Riddelli Frank -- Leaves conduplicate and falcate. Stoloniferous with rosettes up to 6 dm high. Herbage glabrous except for the very scabrous leaf margins. Inflorescence broad-corymbose. Late summer. On chernozems, rare: Kleefeld, Sainte-Geneviève. --O-seMan, US.

12X. S. Bernardii Boivin -- Hybrid with S. ptarmicoides and resembling mainly the latter, but the ligules at first pale yellow, eventually turning white. Leaves mostly about 5 mm wide and the heads not quite so large as the above. Rare: Kleefeld. --seMan, (US).

Hybr. n., Verosimiliter hybridus S. ptarmicoides X S. Riddellii. Ad. S. ptarmicoidem vergens sed floribus minoribus luteolis et albescentibus. Folia tantum latiora. Involucrum 6-7 mm alt. Type: Boivin, Bernard & Perron 12942, Kleefeld, 1½ milles au sud-est, prairie, 16 août 1958 (DAO).

13. S. ptarmicoides (Nees) Boivin (Aster ptarmicoides (Nees) T. & G.; Unamia alba (Nutt.) Rydb.) -- Flowers white and the heads rather large in a flat corymb, resembling an Aster. Mostly ± 3 dm high and scabrous. Leaves very variable in length, very narrow, less than 5 mm wide, very scabrous at least at margin. Mid summer. Frequent on sandier soils in the parkland zone. -- NB-ecS, US.

Stat. n. Doellingeria ptarmicoides Nees, Gen. Sp. Ast. 183, 1832; Chrysopsis alba Nutt., Gen. 2: 152. 1818, nec Solidago alba Miller. The frequency and va-

riety of hybrids between this species and various other Solidago seems to be a clear indication that its relationships lie with the latter genus rather than with Aster. It is an atypical species in any case.

13X. S. lutescens (Lindley) Boivin (Aster ptarmicoides (Nees) T. & G. var. lutescens (Lindley) Gray) -- Hybrid with S. rigida var. humilis. Mainly of the habit of S. ptarmicoides, but the heads smaller, the ligules yellowish, the leaves broader and the upper ones not so much reduced, about half as long as the lower. Herbage densely scabrous-puberulent. Rare: Stoney Mountain, Bird's Hill, Brandon, Kleefeld, Virden, Red Deer, Indian Head, Touchwood. --Man-S, US.

Stat. n., Diplopappus lutescens Lindley ex DC., Prodr. 5: 278. 1836.

14. S. graminifolia (L.) Sal. var. graminifolia -- Povertyweed -- Leaves long linear and isomegueth, mostly 15-20 times as long as wide and usually 5 mm wide or less. Inflorescence a single, terminal, flat corymb of numerous small heads. Second half of summer. Common on shores and wet places. --NF, NS-seMan, BC, US -- Var. major (Mx.) Fern. (var. camporum AA.) -- Leaves broader and usually shorter, mostly 8-10 times as long as wide and commonly over 5 mm wide. -- Mack, (NF), Q-Alta-(BC), US.

S. occidentalis is also reported for our area by Rydberg 1917, 1932, Eastham 1947, Cronquist 1955 and, doubtfully, Boivin 1966. Efforts to substantiate this report have been unsuccessful as no relevant specimen could be located at ALTA, Calgary, CAN, DAO, GH, NY, UBC, WTU, etc.

9. HAPLOPAPPUS Bndl.

Heads yellow as in Solidago, but larger as in Aster. Bristles somewhat unequal.

- a. Leaves finely dissected, pinnatipartite
- 1. H. spinulosus
- aa. Entire to serrate.
- b. Leaves serrate; mostly few-headed
- 3. H. lanceolatus
- bb. Entire; monocephalous.
- c. Subscapose, the leaves nearly all basal, the 1-2 stem leaves much smaller
- 2. H. armerioides
- cc. Stem leaves numerous and not particularly smaller
- 4. H. Lyallii

1. H. spinulosus (Pursh) DC. var. spinulosus (Aplopappus spinulosus (Pursh) DC.; Sideranthus spinulosus (Pursh) Sweet) -- Grayish-tomentose leaves pinnatipartite

to bipinnatifid, the lobes abruptly contracted into white, glabrous, spinescent points. Tegules strongly imbricate, with a dark green and nearly glabrous subterminal patch, and a white point like those of the leaf lobes. Mid summer. Occasional and scattered on steppes and eroded hillsides. --swMan-sAlta, US, (CA).

The more southern var. glaberrimus (Rydb.) stat. n., Sideranthus glaberrimus Rydb., Bull. Torr. Bot. Club 27: 621. 1900, has glabrous leaves.

2. H. armerioides (Nutt.) Gray (H. acaulis AA.; Aplopappus acaulis var. glabratus AA.; Stenotus acaulis AA.; S. armerioides Nutt.) -- Tegules with a conspicuous, dark green, deltoid patch at the squarrose tip. Cushion-forming perennial from a woody taproot. Basal leaves linear, erect, entire. Stem leaves few and inconspicuous, the plant scapose in general habit. Stem moncephalous and usually less than 1 dm high. Late spring. Eroded hillsides and badlands of the Qu'Appelle Valley and southwest. --S, US.

3. H. lanceolatus (Hooker) T. & G. var. lanceolatus (var. Vaseyi Parry; H. integrifolius AA.; Pyrrocoma lanceolata (Hooker) Greene) -- Leaves strongly dimorphic, the basal petiolate, serrate to subentire, lanceolate, 2-5 times longer than the cauline, the latter sessile and clasping at base. Herbage glabrous or lightly villous. Stems stiffly erect from a decumbent base. Heads large, few or solitary. Mid summer. Saline meadows, frequent. -- S-Alta-(neBC), US -- Var. sublanatus Cody -- H. uniflorus (Hooker) T. & G.; Pyrrocoma uniflora (Hooker) Greene) -- Heavily villous-lanate, especially on the involucre. More northern: basin of the Peace. --sMack, nAlta.

The name H. uniflorus is generally misapplied in current floras and monographs. The type of the species (K) is quite typical of what we are calling above var. sublanatus. It is restricted to Canada in its distribution. But H. uniflorus is currently used to designate another species occurring from Montana to California, exclusive of Canada. This U.S. entity was first described as Homopappus inuloides Nutt., 1840 and is more correctly named Haplopappus inuloides (Nutt.) T. & G. The following three varieties are commonly distinguished:

Haplopappus inuloides var. Howellii (Gray) stat. n., H. Howellii Gray, Syn. Fl. ed. 2, suppl. part 1: 446. 1886.

H. inuloides var. gossypianus (Greene) stat. n., Pyrrocoma gossypiana Greene, Pittonia 3: 23. 1896.

H. inuloides var. linearis (Keck) stat. n., H. uniflorus ssp. linearis Keck, Aliso 4: 103. 1958.

An Alberta report by Rydberg 1917 of Pyrrocoma carthamoides Hooker, was repeated by Cronquist 1955 as Haplopappus carthamoides (Hooker) Gray, and queried by Boivin 1967. No justifying specimen could be located at GH or NY in 1965 or at WTU in 1969, etc.

4. H. Lyallii Gray -- Glandular peberulent throughout. Usually less than 1 dm high. Stem leaves oblanceolate, the larger 5-10 mm wide, nearly as large as the similar basal leaves if any. Mid summer. Alpine slopes and shale slides. --swAlta-sBC, (nwUS).

10. CHRYSOTHAMNUS Nutt.

Almost identical to Haplopappus, but shrubby and the heads discoid.

1. C. nauseosus (Pallas) Britton var. nauseosus (C. frigidus Greene) -- Rabbit Brush -- Low shrub with numerous annual branches bearing a small terminal group of discoid heads. Usually less than 4 dm high and the new branches longer than the woody base. Branches whitish with a thin tomentum, sometimes inconspicuously so. Tegules usually tomentose. Mid summer. Badlands, uncommon. --sS-seAlta-BC, US -- Var. glabratus (Gray) Cronq. (var. graveolens (Nutt.) Hall) --More woody and taller, 4-10 dm high and the new shoots usually shorter than the woody base. Tegules glabrous. Estevan. --seS, BC, US.

11. BOLTONIA L'Hér.

Resembles Aster but the pappus is partly of minute bristles and partly of 2 or 4 somewhat longer awns.

1. B. asteroides (L.) L'Hér. var. occidentalis Gray (var. recognita (Fern. & Grisc.) Cronq.; (B. latisquama Gray var. recognita Fern. & Grisc.) -- Inflorescence leaves more or less decurrent. Perennial and stoloniferous. Stem longitudinally striate in light and dark green. Leaves narrowly lanceolate, entire, scabrous-margined. Heads white, resembling Aster. Tegules acute. Fall. Shores, sometimes weedy; rare or possibly overlooked because of lateness. --scMan-scS, US.

In the ozarkian var. latisquama (Gray) Cronq. the tegules are round-obtuse at tip.

12. TOWNSENDIA Hooker

Closely resembling Aster; pappus bristles gradually thickened towards the base, almost awn-like. Monocephalous or stemless.

a. Stem mostly 1-2 dm high 3. T. Parryi
aa. Stemless.

b. Tegules gradually less densely ciliated upwards 1. T. excapa

- bb. More densely ciliate and ending in a tuft
of hair 2. T. Hookeri

1. T. excape (Rich.) Porter (T. sericea Hooker) -- Usually a cluster of 3-6 large heads overtopped by the basal leaves, the latter linear and mostly 2-4 mm wide. Involucre 12-20 mm high, the tegules around 2 mm wide. Ligules pink. Spring. Sandy hillsides, infrequent. -- swMan-sS-seBC, US.

2. T. Hookeri Beaman (T. sericea AA.) -- Like a reduced version of the last. Leaves 1-2 mm wide. Involucre 8-12 mm high. Ligules white. Early summer. Local on sandy steppes and eroded badlands: Cypress Hills and Rockies. --Y, swS-Alta, nwUS.

The range was extended to B.C. in Contr. Gray Herb. 183: 96. 1957, but this may have been a lapsus calami as the specimen cited came from Fort McLeod, in Alberta.

3. T. Parryi Eaton -- A single large head, 3-6 cm wide, at the end of a rather short stem. Perennial. Stem solitary and stiffly erect, or a few together. Leaves linear on the stem, oblanceolate in the rosette. Ligules mauve, drying blue. Early summer. Alpine gravel slopes. --swAlta-seBC, US.

The range of T. spathulata Nutt. was given by Cronquist 1955 as extending north to the mountains of Alberta, while in 1957 in a monograph of the genus, Contr. Gray Herb. 183: 120-4. 1957, J.H. Beaman restricts its range to the mountains of Wyoming. We have not yet ascertained the source of the Alberta report.

13. ASTER L.

ASTER

A basic type with radiate heads, the heads, or at least the ligules, not yellow. Tegules widely varying in length, the outer successively shorter and imbricated. Pappus of fine capillary bristles.

a. Involucre glandular Group A

aa. Not glandular but glabrous or hairy.

b. Heads discoid 24. A. laurentianus

bb. Ligulate.

c. Ligules white, sometimes pink Group B
cc. Mauve or blue to purplish.

d. Leaves gradually dimorphic, the
lower petiolate Group C

dd. Stem leaves all similar, although
the upper sometimes smaller Group D

Group A

Involucre abundantly glandular. Longer and non glandular hairs sometimes also present. Ligules mauve

to blue, except A. alpinus.

- a. Leaves large, broadly and deeply cordate
..... 1. A. macrophyllus
- aa. Broadly lanceolate to linear.
 - b. Leaves narrowly lanceolate to long linear, entire.
 - c. Monocephalous; lower leaves larger and oblanceolate 25. A. alpinus
 - cc. Usually with a few heads; all leaves narrowly linear.
 - d. Tufted; inflorescence branches with many small bracts
..... 22. A. pauciflorus
 - dd. Stoloniferous; branches bearing leaves 1-2 cm long 3. A. campestris
- bb. Leaves 1-5 cm wide, narrowly to broadly lanceolate.
 - e. Leaves conspicuously serrate; mostly 3-5 cm wide 11. A. conspicuus
- ee. Narrower and entire to remotely serrate.
 - f. Leaves short scabrous on both faces and broadly clasping at the base 4. A. novae-angliae
 - ff. Long villous below and cuneate to a narrowly clasping base ...
..... 5. A. modestus

Group B

Ligules white, or sometimes light pink, drying white or not infrequently pale blue. Involucre glandless.

- a. Heads in a corymb.
 - b. Leaves long linear, 5 mm wide or less.
 - c. Upper leaves nearly as long as the lower 16. A. borealis
 - cc. Lower leaves many times longer ...
..... Solidago ptarmicoides
- bb. Lanceolate and much larger 23. A. umbellatus
- aa. In a panicle.
 - d. Tegules thickish, squarrose, spinulose-mucronate; stem uniformly pubescent 12. A. ericoides
 - dd. Tegules thin, straight and not mucronate; stem pubescent in lines.
 - e. Main branches widely spreading, their heads more or less turned upwards 13. A. lateriflorus

- ee. Branches ascending and their heads not particularly secund.
 - f. With a thin stem and few heads, usually less than 15; leaves entire and rarely over 5 mm wide ..
..... 16. A. borealis
- ff. More vigorous plants with more numerous heads.
 - g. Outer tegules larger and longer than the inner 14. A. hesperius
 - gg. Involucre imbricate, the outer tegules somewhat the shorter.
 - h. Main stem leaves typically 1-2 dm long and remotely serrate 15. A. simplex
 - hh. Shorter and entire; petiole narrow 14. A. hesperius

Group C

Ligules blue, varying from mauve to purple, mostly drying light to deep blue. Leaves dimorphic, the lower with a poorly to well defined petiole. Involucre not glandular.

- a. Tegules abundantly puberulent on back; herb 4 dm high or less.
 - b. Leaves serrate 10. A. sibiricus
 - bb. Leaves entire 20. A. adscendens
- aa. Tegules pubescence consisting mostly or entirely of marginal ciliation; plants usually taller.
 - c. Achenes glabrous or nearly so.
 - d. Leaves thickish and somewhat glaucous, the lower cuneate to a winged petiole ..
..... 9. A. laevis
 - dd. Leaves not fleshy nor glaucous, abruptly rounded to a wingless or winged petiole; tegules less imbricated.
 - e. Lower leaves narrowly ovate; stem pubescent in lines at least above the middle 2. A. ciliolatus
 - ee. Lanceolate; stem glabrous except in the inflorescence ... 6. A. MacCallae
- cc. Achenes pubescent; herbage ± pubescent.
 - f. Tegules not regularly imbricated, a few of the outer at least as long and as large as the inner ones, at least longer than the middle ones
..... 17. A. subspicatus

- ff. More or less imbricated, the outer being shorter; leaves usually narrower 18. A. occidentalis

Group D

Like the last, but the lower leaves more similar to the upper, and not petiolate, being clasping to tapered at base. Upper leaves usually somewhat shorter than the middle ones, not otherwise differentiated.

- a. Leaves densely silvery-silky, 4 cm long or less 8. A. sericeus
 aa. Leaves much longer and much less densely pubescent.
 b. Involucre 8-12 mm high; ligules 1.5-2.5 cm long; leaves broadly lanceolate ...
 21. A. Engelmannii
 bb. Heads smaller; leaves lanceolate to long linear.
 c. Stem pubescent in lines.
 d. Peduncle lightly pubescent in lines; outer tegules shorter than the inner 14. A. hesperius
 dd. Peduncle heavily pilose; outer tegules longer than the inner ..
 17. A. subspicatus
 cc. Stem pubescence uniformly distributed.
 e. Outer tegules much broader and longer.
 f. Stem coarsely hirsute. 7. A. puniceus
 ff. Minutely strigose or puberulent 19. A. Eatonii
 ee. Tegules imbricated, i.e. the outer ones successively shorter.
 g. Tegules glabrous dorsally; stem minutely pubescent ...
 19. A. Eatonii
 gg. Tegules pubescent dorsally; stem pubescence coarser ...
 20. A. adscendens

1. A. macrophyllus L. -- (Pétouane) -- Leaves conspicuously cordate, long petiolate, rather large, mostly about 1 dm across. Herbage densely glandular-puberulent throughout, varying to glabrous or hirsute below. Heads corymbose. Ligules pinkish to pale blue. Late summer and early fall. Deciduous forests, rare: Whiteshell -- NS-seMan, eUS.

After more than a hundred years of successive reports, the only tangible and firm evidence for our area

still consists of three rosette leaves collected by H.J. Scoggan in the Whiteshell Forest Reserve in 1951 (CAN). Although a sterile gathering, it seems clearly referable to A. macrophyllus on the basis of size, pubescence, glandulosity and thickened mucros. Dawson's 1875 report for the Turtle Mountain (TRT) proved to be based on a specimen of Aster ciliolatus. Reported for Norway House by Hooker 1834 and Macoun 1884 but the locality has never been confirmed and was questioned by Scoggan 1957. A Richardson collection labelled Lake Winnipeg (CAN) is correctly named, but almost certainly did not come from the locality stated. Richardson's localities are usually to be interpreted in very broad terms and his specimen was probably collected in the Whiteshell or more likely in adjacent western Ontario where the species is common. Both areas were traversed by Franklin's partly to which Dr. Richardson was attached.

2. A. ciliolatus Lindley (A. cordifolius AA.; A. Lindleyanus T. & G.) -- A common forest species with blue ligules and dimorphic leaves, the lower ovate on a long and narrowly winged petiole. Herbage villous to nearly glabrous, the stem and branches pubescent in lines. Upper leaves \pm lanceolate. Mid summer. Deciduous forests. --Mack, NS, NB-BC, US.

There has always been a fair amount of confusion between A. ciliolatus and the more eastern A. cordifolius L., the latter being reported for 5 localities in Manitoba. We have examined the specimens from Winnipeg, Miami and Grand-Rapide and were not surprised when each proved to belong to A. ciliolatus. The Swan Lake and Brandon have yet to be examined, but they are not expected to belong to A. cordifolius.

Aster sagittifolius Wedemeyer was reported by Löve 1959 from Otterburne (DAO, MSM) on the basis of what we estimate to be an exceptionally lush specimen of A. ciliolatus.

2X. A. ciliolatus X simplex -- Or perhaps A. ciliolatus x hesperius. Middle and lower leaves lanceolate, tapered to base to a winged petiole 1-4 cm long. About 4 dm high. Pubescence of the herbage varying from \pm villous (Mainly the inflorescence) to very finely scabrous (i.e. the upper leaf surfaces). Main leaves mostly 1.0-1.5 cm wide, the upper sessile, shorter and narrower by about half. Heads conspicuously bicolour, the ligules white, fading mauve, the center passing from light to deep purple. Brokenhead. --sMan.

3. A. campestris Nutt. var. campestris -- Leaves very narrow and densely glandular-puberulent in the inflorescence. Stolonerous. Herbage finely strigose below. Leaves long linear, mostly 2-3 mm wide, the upper

gradually shorter down to about 1-2 cm. Ligules blue. Late summer. Rolling steppes. --swAlta-BC, wUS.

4. A. novae-angliae L. --Michaelmas Daisy -- Stem leaves isomegueth, lanceolate with a broadly clasping base, numerous and closely spaced. Herbage finely scabrous throughout and glandular-puberulent, especially in the inflorescence. Stem also \pm hirsute. Heads corymbose or paniculate. Ligules reddish-purple. Mid to late summer. Local in low, open spots. --NS, NB-swQ-sMan, US.

Sometimes cultivated as an ornamental; not otherwise known from west of Manitoba. It is however one of those species that may be expected to escape and become eventually naturalized in the Aspen Grove zone. Acadian occurrences are such escapes.

5. A. modestus Lindley (A. major (Hooker) Porter) -- Habit of the last but the leaves narrowed to a narrowly clasping base. Densely glandular-puberulent in the inflorescence, but mainly villous below, especially so on the stem. Heads usually few, corymbose to paniculate. Ligules deep mauve. Second half of summer. Wet to boggy spots. --(Y)-Aka, O-(seMan)-wcS-BC, US.

6. A. MacCallae Rydb. --Rather similar to A. ciliolatus but the leaves firmer and narrower and the herbage much less pubescent to glabrous. Lower leaves lanceolate, rounded to an asymmetrical base and a very long petiole, the latter very narrowly if at all winged. Upper leaves linear. Heads few. Late summer. Near mountain streams. --swAlta-seBC.

7. A. puniceus L. var. puniceus (var. oligocephalus AA.) --Pitnagen, Tea-Flower -- The coarse stem coarsely and conspicuously hispid. Usually around 1 m high. Leaves numerous, not reduced upwards, long-lanceolate with broadly auriculate clasping bases. Panicle usually ample. Tegules variable, the outer either longer or shorter than the inner, often somewhat squarrose. Ligules bluish. Mid summer. Common in marshy places. --L-SPM, NS-Alta, US--F. candidus Fern. --Ligules white. Local. --sMan, (US).

Var. oligocephalus Fern., the usual phenotype in the northeastern part of the range of the species, has fewer heads, these solitary on long peduncles which are not bracteolate, but leafy to the base of the head. It was given by Fernald 1950 as ranging to Mackenzie and Saskatchewan. In 1965 the Gray Herbarium held only one Saskatchewan sheet classified (but not revised) under this name: Breitung 866, Wallwort. There was no Mackenzie sheet, but two sheets from the upper Mackenzie basin in Alberta were also filed as var. oligocephalus, although unrevised; they came from the Slave and Embarras rivers. All these specimens were closer to our

concept of var. puniceus and were so revised.

8. A. sericeus Vent. - Leaves fugaceous, those below the inflorescence usually gone by flowering time. Tufted perennial from a short, woody rhizome, 3-4 dm high. Leaves oblong-lanceolate, entire, sessile. Heads few on very leafy branches. Tegules sericeous and long, squarrose, acute. Late summer. Local on light soils. --WO-sMan, cUS.

9. A. laevis L. (var. Geyeri Gray; A. Geyeri (Gray) Howell) -- Leaves thickish, somewhat fleshy and slightly glaucous. Leaf margins scabrous, herbage otherwise glabrous. Leaves ovate to lanceolate, the upper sessile with a broadly clasping base, the middle ones oblanceolate or narrowed to a broadly winged petiole and a clasping base, the lower petiolate. Involucre strongly imbricated, often with conspicuous, rhomboid, green patches on the tegule tips. Mid summer. Frequent on better prairie soils. --Q-neBC, US.

Often subdivided in two varieties or species on the basis of degree of development of the green subterminal patch on the tegules. The specimens examined did not exhibit any morphological discontinuity on this score and both types appear to have substantially the same range.

Reports from west of us should all be carefully checked as the species appears to reach only into north-eastern B.C.: Dawson Creek (DAO), etc. Reports from southeastern B.C. were based on specimens of other species: the T. Ulke collection at Horsethief Creek (TRT) was a specimen of A. MacCallae, etc. Reports from southern Yukon are apparently based on a collection at mile 611 on the Alaska Highway. But mile 611 is in B.C. (see Aster conspicuus), about 16 miles short of the Yukon boundary.

10. A. sibiricus L. var. sibiricus (A. Richardsonii Sprengel) -- Tegules purple-margined around a green center. Loosely tufted to stoloniferous and 1-4 dm high. Leaves ± serrate above the middle, the upper oblong-lanceolate and sessile, the lower narrowly oblanceolate and petiolate. Heads solitary or few on sub-naked peduncles. Ligules purplish, usually drying blue. Mid summer to early fall. Alpine shale slides, descending to river shores. --Mack-Aka, Alta-BC, US, Bur -- F. albinus Lepage -- Ligules white. Local: Ft. Saskatchewan -- Aka, Alta.

The more northern var. pygmaeus (Lindley) Cody tends to be lower and monocephalous, its leaves entire and narrower, not over 5 mm wide, and linear-lanceolate.

11. A. conspicuus Lindley -- A coarse and showy herb, densely glandular throughout, and with rather large

heads. Up to 1 m high. Leaves large, narrowly obovate to broadly oblanceolate, narrowed and rounded to a sessile or subclasping base. Heads few, corymbose to broadly panicleate. Ligules violet. Mid summer to frost. Light woods. --S-BC, US.

Our species was reported from Yukon by Hultén 1950, Cronquist 1955 and Boivin 1967. The only relevant specimen cited or located was an Anderson collection from mile 62 on the Alaska Highway (S), somewhere in the region of Fort St. John and about 200 miles south of the Yukon boundary. Occasional distributional reports from Yukon are, like this one, actually based on B.C. collections, including many Alaska Highway collections. Point O on the Highway is at Dawson Creek in B.C., at 55° 45'N., 120° 15'W, and the road does not cross into Yukon until mile 627. Then for the next 130 miles or so, the road repeatedly crosses the B.C.-Yukon boundary. From about mile 730 on, the road stretches diagonally across Yukon Territory until it enters Alaska at mile 1221.

12. A. ericoides L. var. commutatus (T. & G.) Boivin (A. adsurgens Greene; A. commutatus (T. & G.) Gray; A. crassulus Rydb.; A. falcatus Lindley, var. crassulus (Rydb.) Cronq.; A. multiflorus AA.; A. pansus AA.; A. polycephalus Rydb.; A. stricticaulis (T. & G.) Rydb.) -- An obvious and common prairie species with rather small heads and short white ligules. Tufted from a woody corm in dense sod, becoming long stoloniferous in disturbed soils. Herbage scabrous-puberulent to glabrous. Leaves linear. Tegules squarrose, with a large green tip and spinulose mucro. Second half of summer. Common and abundant in nearly all kinds of steppe or prairie. --Mack-Y, O-BC, US.

Two more varieties occur to the east and the west of us. Both are generally larger plants with more numerous and smaller heads on more heavily bracteolate peduncles. See Nat. Can 89: 67-70. 1962 for a detailed comparison. The eastern var. ericoides is stoloniferous and its outer tegules are 2 mm long or less. The western var. pansus (Blake) Boivin is tufted from a woody corm and its outer tegules are 2-3 mm long.

Within our area, whenever a recently built road cuts across virgin prairie thus opening part of the habitat to pioneering activities, one can usually find specimens with vigorous rhizomes radiating from an old and half disintegrated corm. Clearly, the presence of corm or stolons in var. commutatus is of ecological rather than taxonomic value. Mentions of A. pansus for our area will be found to refer the tufted phase of var. commutatus.

13. A. lateriflorus (L.) Britton -- Similar to the next two but the heads are secund on the more widely

spreading branches, and the corolla lobes more elongate, being 1.0 - 1.5 mm long. Leaves \pm lanceolate, serrate, glabrous below except for the pilose midnerve. Heads numerous and smallish, at first white, becoming bicolour with a purplish center. Late summer. Around bluffs and in light woods. --NS-sMan, US.

A. praealtus Poiret has been reported from our area and other parts of Canada, but this could not be confirmed as all Canadian specimens seen proved to belong to other taxa. Specimens at DAO were mainly of A. hesperius. Those from WIN were mostly A. simplex with mauve ligules, some were A. hesperius, one sheet from Winnipeg Beach was A. lateriflorus, another was the hybrid A. ciliolatus X A. simplex (also at DAO). Those at CAN were mostly A. simplex.

A. praealtus stands largely intermediate between A. hesperius and A. simplex. It is generally a larger plant with a more open panicle in the manner of A. simplex, its main leaves are around 1 dm long and mostly 1.0 - 1.5 cm wide. But it resembles A. hesperius by its leaves being entire and the ligules pale mauve to light blue. The main criteria are in the leaf nervation.

In A. simplex the primary leaf nerves are readily traceable, being somewhat stronger and slightly rugose below. They are often nearly parallel to the midnerve. The interconnecting network of secondary and tertiary nerves delimitates small tissue areas that are mostly oblong and mostly 1.5-2-(6) times longer than broad. On each side of the midnerve there is a narrow strip of tissue that lies largely outside the reticulum, being merely traversed by the primary nerves.

In A. hesperius the leaf venation is essentially as in A. simplex, especially if the leaves are of the broader type. If the leaves are very narrow, the primary nerves may not be so clearly distinct, but the tissue areas will remain elongate.

In A. praealtus only the midnerve is well defined and rugose. The rest of the nervation lacks clearly defined primary nerves but consists in a reticulum which delimitates irregular polygons, most of the latter being about as long as wide, and this reticulum extends right up to the midnerve. Canadian reports of A. praealtus will generally refer to specimens of A. hesperius or of A. simplex with coloured ligules.

14. A. hesperius Gray var. hesperius (A. coerulescens AA.; A. franklinianus AA.; A. johannensis AA.; A. Oosterhoutii AA., A. salicifolius AA.) -- Perhaps our commonest and most widespread species, yet highly variable and rather nondescript. Stoloniferous and forming large colonies, often up to 1 m high. Leaves entire, lanceolate to narrowly linear, less than 1 cm wide. Heads many

in a narrow panicle. Involucre 5.0-7.5 mm high, its tegules narrow and long attenuate, their midnerve green and slightly broadened above into a narrow and elongated green tip which is usually less than 0.5 mm wide. Tegules less strongly imbricated than A. simplex, or exceptionally the outer tegules longer than the inner. Ligules white to mauve, often drying pale blue. Second half of summer and first half of fall. Open places, usually in the wetter spots. --Mack, Q-BC, US.

Two variants are worthy of notice. Some transitional specimens have the longer outer tegules of A. subspicatus but are otherwise similar to A. hesperius by the size and shape of leaf and/or pubescence of peduncle. They have been called A. hesperius var. laetivirens in Western Canada and are sympatric to A. subspicatus. A check of the eastern material shows that this transitional form is also present especially in areas where A. subspicatus occurs. Because of its sympatry with A. subspicatus we estimate that var. laetivirens is not a semi-autonomous population but merely an extreme of variation, hence not rating taxonomic recognition as a variety within our scheme of taxonomic categories, and better placed in the synonymy of A. subspicatus. Western specimens previously referred to var. laetivirens have been mostly placed in A. subspicatus, but the similar specimens from the east have been versed mainly in A. hesperius; the choice being made partly on the basis of greater similarity, partly because of what else is known to occur in the same general area.

In var. gaspensis, the second variant, tegules are more or less imbricated as in A. hesperius, but otherwise resemble A. subspicatus in being longer, heavier green and the outer ones wider, mostly 1.0 - 1.5 mm wide, and in being green throughout or nearly so. Thus the larger involucre of var. gaspensis, 8-12 mm high, tends to be darker green than the foliage. The main leaves are entire and mostly 1.0-1.5 dm long and (0.7)-1.0-1.5-(3.0) cm wide, tapered below to a narrowly clasping base, and thus resemble A. subspicatus, but they are not contracted into a broad petiolar base. The pubescence of the peduncle is of numerous decurrent lines of pubescence. Originally described from the shores of the Bonaventure river, var. gaspensis is now known from the shores of the Nottaway (Dut. & Lep. 35311 & 35342) and from Cabbage Willows (Stirrett 1127 at DAO) on the south coast of James Bay just east of the interprovincial boundary. Var. gaspensis has also been reported in Bull. Torr. Bot. Club 74: 143. 1947 as occurring around Lake Mistassini.

Aster hesperius Gray var. gaspensis (Vict.) stat. n., A. gaspensis Vict., Contr. Lab. Bot. Un. Mtr. 20:

3.1932. A. hesperius var. gaspensis f. albiflorus (Vict.) stat. n., A. gaspensis Vict. f. albiflorus Vict., Nat. Can. 71: 209.1944; A. novi-belgii L. f. albiflorus (Vict.) Boivin, Nat. Can. 94: 646. 1967.

A. johannensis Fern. was accredited to Manitoba on the basis of a series of specimens (CAN, DAO, LKHD) since revised to A. simplex or to A. hesperius.

The next three species and A. hesperius are not always clearly distinct inter se.

15. A. simplex W. var. simplex (var. ramosissimus (T. & G.) Cronq.; A. longifolius AA.; A. paniculatus Lam.) -- Like a larger phase of the last. Main stem leaves 1-2 dm long, usually 1-2 cm wide. Involucre 4-6 mm high. Ligules white; tubular flowers also white, rarely either or both pinkish. Second half of summer. Wettish open places. -- NF, NS, NB-cS, US.

In the estuary of the Saint Lawrence it gives way to a smaller plant with shorter branches, known as var. estuarinus Boivin.

The various species presented in this flora do not always differ from one another in the same manner. Usually there is a definite morphological discontinuity between closely related species and it is possible to assign to each taxon definite morphological boundaries that are not exceeded except in very unusual cases. Further, the specific criteria for most species exhibit constancy of association. Such species are said to be monothetic; they can be accurately defined by a minimum set of criteria which are both essential and sufficient for the identification of representative specimens. Taxa that do not fit within the definition above are termed polythetic. See Sneath, P.H.A., Symp. Soc. Gen. Microb. 12: 291-332. 1962, and Morse, L.E., Taxon 20: 269-282. 1971.

Polythetic taxa grade into one another and cannot be assigned precise morphological boundaries; they can be defined only in terms of a series of criteria which need not be all present; suffices to recognize such a taxon that most or nearly all its criteria be present. Often, the various criteria have unequal value and one of them may be much more important than the others. Field experience, herbarium practice and a bit of flair are helpful in dealing with such taxa and deciding which character is to be given more importance. Known distribution or ecological preferences can offer strong leads, but one must not transform the place of origin or the habitat into taxonomic criteria.

Taxa of all ranks, from form to family or higher, can be either monothetic or polythetic.

Throughout this flora we have tried to restrict the use the rank of species to monothetic taxa. Monothetic

species are presumably isolated genetically, while polythetic ones usually stand in partial isolation only. Whenever two or three taxa intergrade to form a monothetic cluster of polythetic entities, we have usually treated them as so many varieties of a single species. Hence our varieties are mostly polythetic taxa.

We have also tried to use each rank, such as species, for taxa that are roughly comparable with one another; comparable as to the kinds, manners, and degrees of differences.

The species is also the basic concept by which one initially apprehends the various elements of a flora or particular group; other ranks are usually apprehended later as collections or subdivisions of species. Hence it is essential that the species concept should correspond to the level of abstraction most easily assessable to our expected readers. In simpler words the species should be and remain a practical concept as stated in our preface.

Now, it is not possible at all times to equate species and monothetic, and at the same time define only species that are roughly equivalent and recognize nothing but practical units easily comprehended by the informed (but not necessarily specialist) reader.

Some of the richer clusters of polythetic taxa are very complex and the range of their morphological variations is so wide that they cannot possibly be held as roughly equivalent to other species in the same genus. As clusters they are also very difficult to apprehend and delimit from the non-member taxa. Practical experience has shown that such clusters are easiest to deal with when each major element is rated as a species and allowance is made for a certain amount of integrading. Specimens with intermediate morphology may be frequent and are best treated as genuine intermediates rather than hybrids, since there is no sound basis to assume that they are significantly more heterozygous than most other individuals referred to the cluster; they merely seem to present less frequent recombinations of characters.

Aster simplex stands at the center of a very complex cluster of polythetic taxa, comprising with us A. hesperius, A. borealis, A. subspicatus and A. lateriflorus. The cluster extends into eastern Canada with the following additions A. dumosus L., A. vimineus Lam., A. Tradescantii L., A. novi-belgii L. and A. puniceus. More elements, such as A. praealtus Poiret, also occur further south.

If the cluster was much smaller, say if it comprised only A. simplex and A. borealis, we would not have hesitated to reduce it to a single species with a varie-

ty. But the cluster being as complex as it is, a different kind of solution is called for. Before one can achieve a good general view of the A. simplex cluster, one must first become acquainted with most of its major units; hence in the present case the primary unit of intellectual apprehension is not the monothetic cluster, but the polythetic and intergrading species as we have described them above and below. This is why we have retained these intergrading taxa at the rank of species.

Rydberg's floras are good examples of texts based primarily on the polythetic species. In such texts the need to recognize subspecies and varieties is greatly lessened, and most, if not all, taxa can be conveniently termed species. At the other end of the range the species as used by Gleason 1952 and Hitchcock 1969 is mostly monothetic. Fernald's Manual is a halfway house. Our approach is closer to that of Gleason and Hitchcock.

16. A. borealis (T. & G.) Prov. (A. junceus AA.; A. junciformis Rydb.) -- Like the last two, but the stem thin and wiry, the leaves long and narrow, the heads large and few. Leaves up to 2 dm long and usually less than 5 mm wide. Heads mostly 1-8. Second half of summer. Frequent in very marshy or boggy places. --Mack-Aka, NS-BC, US.

Successively this taxon has been called A. laxifolius, A. laxifolius var. borealis, A. borealis, A. junceus Aiton and more recently A. junciformis. But A. borealis appears to be the earlier and correct name. The synonymy is as follows:

A. borealis (T. & G.) Prov., Fl. Can. 1: 308, 1863; A. laxifolius Nees var. borealis T. & G., Fl. N. Am. 2: 138. 1841; A. Franklinianus Rydb., Bull. Torr. Bot. Club 37: 141. 1910; A. junciformis Rydb., Bull. Torr. Bot. Club 37: 142. 1910.

This entity was usually placed under A. laxifolius until Gray 1884 pointed out that Nees' specimens belonged to A. paniculatus (= A. simplex). As a correct name Gray then took up A. junceus Aiton, the type of the latter coming from Halifax. Now A. borealis does not occur in mainland Nova Scotia; obviously Gray's choice of name was unsound, but this escaped his attention, probably because of the relatively limited number of specimens per species in the herbaria of the last century, the distribution of any species being usually known only in very general terms.

The matter rested there for another half century until L.H. Shinnars, Am. Midl. Nat. 26: 411-412. 1941, pointed out that Aiton's specimen was unlikely to be identical with our plant since it came from outside the range of our taxon. Hence A. junceus Aiton had to be

rejected as misapplied and another name was substituted, namely A. junciformis. The latter name had been proposed by Rydberg as a western segregate of what we call A. borealis. We do not consider A. junciformis to be a tenable segregate of A. borealis and the latter is retained as the earlier name.

A. longulus Sheldon is reputed to be the hybrid A. borealis (or junciformis AA.) X A. hesperius (or caerulescens AA.) and is the source of many obscure or baffling reports for western Canada. Rydberg 1917 and 1932 reports it from Sask. and B.C.; Russell 1944 and 1954 lists collections from Pike Lake and Swift Current; Breitung 1947 and 1957, repeated by Boivin 1967, mentions McKague and Wallwort.

The type of A. longulus was the object of a detailed study by L.H. Shinnars in *Rhodora* 44: 338-9. 1949. It seems to be essentially similar to A. borealis except for the pubescence being more abundant in the manner of A. puniceus. Shinnars estimated that Rydberg's report was probably based on specimens of A. hesperius (or A. caerulescens AA.) His guess is partly confirmed by two Saskatchewan (CAN) collections identified A. longulus by Rydberg but which seem typical enough of A. hesperius. Russell's specimens have not been seen. Breitung quoted his collections 865, 871 and 1503; these (DAO) have been revised to A. hesperius and A. simplex. No specimen was seen from our area that we could clearly place with A. longulus as described by Shinnars.

17. A. subspicatus Nees var. subspicatus (A. ciliomarginatus Rydb.; A. foliaceus Lindley, var. Parryi (D.C. Eaton) Gray; A. frondeus (Gray) Rydb.; A. hesperius Gray var. laetivirens (Greene) Cronq.; A. Tweedyi AA.) -- Pitnagen, Tea-Flower -- A few outer tegules longer and larger than the middle and (usually) the inner ones. Stem pilose along a longitudinal strip. Leaves ± lanceolate, the middle and lower ones often oblanceolate, the middle ones most often narrowed below to a narrowly clasping base, the margin scabrous, the limb glabrous to scabrous above. Tegules usually green to the tip, sometimes squarrose, ciliate, the involucre otherwise glabrous, but the peduncle heavily pilose. Ligules blueish. Mid summer to late fall. Near mountain streams. -- K, Aka, L-NF, NS, NB-eMan-BC, US -- Var. apricus (Gray) Boivin -- Smaller, only 2.5 dm high or less. Leaves narrowly oblanceolate. Tegules usually purple-tipped. The more common phase at higher altitudes. -- swAlta-BC, (wUS).

Var. apricus (Gray) stat n., A. foliaceus Lindley var. apricus Gray, Syn. Fl. 1,2: 193. 1884.

A. subspicatus is a difficult species, difficult to delimitate, difficult to grasp, and difficult to organize into its component variations. It is clearly related to A. hesperius into which it grades so thoroughly that the two are separable only arbitrarily. In the east it grades similarly into A. novi-belgii L. All three are however only partly sympatric and, on that basis, their distinction is considered significant. There is also some conflict as to what constitutes here the most satisfactory taxonomic boundary.

We have placed into subspicatus all those specimens with a few outer tegules green throughout and more or less equaling or overtopping the inner ones. Such specimens are also commonly separable from A. hesperius by a number of other characters none of which is quite constant. In A. subspicatus the leaves are commonly narrowly lanceolate and somewhat larger, usually around 1 dm long and 1 cm wide, the sessile blade is less narrowed at base and definitely clasping (not or barely clasping in hesperius); the larger lower leaves will be slightly contracted below into a broadly winged and ill-defined petiole. The peduncle is densely pubescent (only pubescent in lines in A. hesperius). Pappus at first white; often becoming purple-tinged. Further in A. subspicatus the outer and broader tegules are green throughout or nearly so, while the other tegules have a rather broad and intense green patch, usually around 1 mm wide, the net effect is that the involucre is as green or somewhat darker green than the rest of the foliage. In A. hesperius the tegules are narrower by half and the green patches still narrower and light green, the involucre is obviously paler than the leaves. The ligules are usually of a deeper blue in A. subspicatus.

As defined here A. subspicatus is very similar to A. foliaceus sensu Fernald 1950, except that the latter would distinguish as A. crenifolius (Fern.) Cronq. one broad-leaved collection, perhaps of hybrid origin. In Cronquist 1952 the subdivision is on a different basis and the bulk of the eastern material that we call A. subspicatus is placed in A. johannensis along with much of the eastern specimens of A. hesperius, while the broader-leaved are placed in A. crenifolius. In Cronquist 1955 the western material of what we call A. subspicatus is distributed between three species. If the leaves are not contracted at base into a broadly winged petiole, it is called A. hesperius var. laetivirens (vel sphalmate var. laetevirens). If the middle and lower leaves are contracted below, they may be called A. foliaceus if the leaves are entire or only obscurely denticulate, but A. subspicatus if the leaves are obviously serrate.

As can be gathered by Cronquist's treatment, the western phase of A. subspicatus is more variable; its lower leaves are sometimes attenuate into a barely winged petiole, more infrequently a basal rosette will be produced. Thus we are not fully convinced that the eastern and western populations should be treated as a single taxon. But being unable to establish a satisfactory morphological basis for a taxonomic distinction, we have retained them as a single taxon.

18. A. occidentalis Nutt. var. occidentalis -- Ligules blueish like the last, but the tegules imbricated, the outer being shorter and often squarrose. Mostly 2-4 dm high. Leaves narrowly lanceolate, usually less than 1 cm wide, the lower long petiolate. Heads mostly less than 10, paniculate or more often corymbose, borne on branches bearing few, if any, bracts. Second half of summer. Near shores. --(Mack), wAlta-BC, US.

Grades into the more southern var. intermedius Gray, taller, with more heads, these paniculate, and borne on branches with numerous bracts.

19. A. Eatonii (Gray) Howell (A. Mearnsii Rydb.) -- Outer tegules oblanceolate with a dark green and broad tip, glabrous dorsally and somewhat ciliate, from much shorter to much longer than the inner. Resembling the above two, but the stem leaves not dimegueth, rather narrowly lanceolate to linear. Stem pubescence also similarly fine and not in lines. Mid summer. Along creeks and rivers: Cypress Hills and Rockies. --swS-sAlta-sBC, wUS.

Reportedly the ligules vary from white to blue; but the latter colour clearly prevailed in all the Canadian specimens checked.

20. A. adscendens Lindley (A. chilensis Nees ssp. adscendens (Lindley) Cronq.; A. oblongifolius AA.; A. Richardsonii AA.; A. subgriseus Rydb.) -- Involucre similar to that of A. ericoides but the heads larger and the ligules blue. Mostly 2-4 dm high. Herbage more or less villous, especially the stem. Leaves linear, the lower much longer, narrowly oblanceolate and tapering to a subpetiolar base. Tegules much imbricated, squarrose, with a broad green tip, spinulose-mucronate. Pappus rather dark gray violet. Late summer. Steppes; uncommon. --S-seBC, wUS.

21. A. Engelmannii (Eaton) Gray -- Tegules broadly margined in purple in the upper third. Leaves soft pubescent and finely glandular below, to nearly glabrous. Heads largest, 3-5 cm across. Peduncles naked. Ligules mauve. Mid to late summer. Mountain meadows. --swAlta-sBC, wUS.

22. A. pauciflorus Nutt. -- Heads few on elongate and bracteolate peduncles, in a densely glandular-puberulent corymb. Loosely tufted, the stems 2-3 dm high, decumbent at base. Leaves narrow and long linear, much reduced upwards and grading into the small inflorescence bracts. Ligules white, sometimes fading mauve and drying pale blue. Second half of summer. Alkali flats. -- sMack, Man-sAlta, cUS.

23. A. umbellatus Miller var. pubens Gray (A. pubentior Cronq.; Doellingeria pubens (Gray) Rydb.) -- Heads white in a broad corymb. Leaves numerous, broad, lanceolate. Involucre only slightly longer than the mature seeds. Second half of summer. Moist open ground. -- (NB-Q)-O-Alta, (US).

In our variety the herbage is densely puberulent including the tegules. Also the upper leaf surface is less densely puberulent than the lower, and ligules are only 4-7 mm long. In the more eastern var. umbellatus the stem and tegules are glabrous or nearly so, the leaves are glabrous below, or at least less puberulent below than above, the involucre is sometimes shorter than the seeds, and the ligules are more variable, being commonly narrower and up to 8-(12) mm long. Budd 1957 and 1964 reports the typical variety to be common in Manitoba, but in 1969 all the specimens at SCS were correctly filed as var. pubens. The source of Budd's report remains unclear, unless it was based on such earlier reports as were discounted by Scoggan 1957.

Var. pubens is sometimes rated as a distinct species, but except for the density of pubescence, none of the diagnostic criteria amounts to much more than weak tendencies with broad zones of overlap.

24. A. laurentianus Fern. (A. angustus (Lindley) T. & G.; A. Brachyactis Blake) -- Discoid, annual. Leaves long linear, the earlier ones \pm fleshy and longer, but deciduous and usually lacking in herbarium specimens. Glabrous except for the scabrous-ciliate leaves. Tegules isomegueth or nearly so. Inflorescence narrowly paniculate to much diffused. Pappus often becoming much larger as the specimen dries. Late summer to frost. Saline shores, sometimes weedy. -- seK-Y, PEI-BC, US, (eEur).

Young plants of A. Brachyactis Blake have larger and fleshy leaves which soon wither. These are usually lacking in herbarium specimens. The type material of A. laurentianus, a name older than A. Brachyactis, is made up of such juvenile and fleshy plants.

25. A. alpinus L. (var. Vierhapperi (Onno) Cronq.) -- With a single large head. Tufted, 1-2-(3) dm high.

Herbage densely pilose and inconspicuously glandular-puberulent throughout. Upper leaves linear, much reduced. Heads 3.5-4.0 cm across. Tegules purple-margined and almost isomegueth, thus resembling an Erigeron. Ligules usually white, varying to pink or mauve. First half of summer. Dry mountain slopes and Pine forests. -- Mack-Y, swAlta-BC, (US), nBur.

A. Tradescantii L. was credited to Saskatchewan by Macoun 1886, repeating a report by Gray 1884, but was ignored by later authors. The basis for this debatable report has not been investigated.

14. MACHAERANTHERA Nees

A minor segregate of Aster, without stolons but with a well defined taproot.

- a. Leaves at least pinnatifid..... 1. M. tanacetifolia
- aa. Serrate to entire.
- b. Leaves all or mostly entire..... 2. M. canescens
- bb. All spinulose-serrate..... 3. M. grindelioides

1. M. tanacetifolia (HBK.) Nees -- Leaves pinnatifid to tripinnatifid. Annual. Herbage abundantly glandular-puberulent, sometimes also pilose. Leaf lobes white-spinulose at tip. Heads ± corymbose. Tegules long squarrose, green above the middle, whitish below. Ligules blue. (Early summer?). Arroyos, rare. --swAlta, cUS, (CA).

Still known only from the original collection by Dawson in 1881 along the Belly River (CAN), presumably near the 49th parallel. Its occurrence in Canada has yet to be confirmed.

2. M. canescens (Pursh) Gray (M. pulverulenta (Nutt.) Greene; Aster canescens Pursh, var. viscosus (Nutt.) Gray) -- Herbage densely grayish-puberulent. Annual, diffusely branched. Leaves mainly entire, but the earlier stem leaves often remotely dentate. Tegules short-squarrose, the deflexed part deep green, densely puberulent and densely glandular, the lower part whitish and glandless. Ligules blue. Summer. Badlands and saline flats. --sS-sBC, wUS.

3. M. grindelioides (Nutt.) Shinners var. grindeloides (Haplopappus Nuttallii T. & G.; Sideranthus grindelioides (Nutt.) Britton) -- Leaves thickish and quite regularly spinulose-serrate. Perennial with tufted annual stems arising from a thick and porous-woody taproot. Leaf teeth ending in long, white, spinulose setae. Heads discoid, yellow. Tegules densely puberulent and densely glandular. First half of summer. Dry hills and badlands. --swS-sAlta, US.

The more southern var. depressa (Maguire) Cronq. & Keck is essentially a smaller plant, perhaps only a dwarf form of more arid places.

15. ERIGERON L.

FLEABANE

Closely resembling Aster and perhaps grading into it. Tegules usually isomegueth and usually very narrow, i.e. less than 1 mm wide; ligules mostly similarly narrow. Not stoloniferous but loosely tufted or taprooted and frequently with few or only one large head, usually borne on a long subnaked peduncle.

- a. Heads discoid or with very short (1-3 mm) and inconspicuous ligules..... Group A
- aa. Heads conspicuously radiate.
 - b. Less than 2 dm high and typically monocephalous.
 - c. Stem leaves numerous.
 - d. Ligules white Group B
 - dd. Ligules coloured Group C
 - cc. Foliage mainly basal, the stem leaves mostly 1-3 or none Group D
 - bb. Taller or many-headed, usually both.
 - e. Ligules white Group B
 - ee. Ligules coloured Group C

Group A

Heads discoid or merely with short and inconspicuous ligules projecting only 1-(3) mm beyond the tegules.

- a. Leaves deeply dissected 15. E. compositus
- aa. Entire.
 - b. Monocephalous and 1 dm high or less.
 - c. Involucre usually \pm 7 mm high and heavily lanate in dark blue.. 13. E. uniflorus
 - cc. Involucre smaller, 5-6 mm high, and merely pilose towards the base with hyaline hairs 21. E. Scotteri
 - bb. Normally taller and the heads many to numerous; involucre not lanate.
 - d. Involucre only 2.5-5.0 mm high and glabrous 24. E. canadensis
 - dd. Heads larger and variously pubescent or glandular.
 - e. Involucre finely glandular, little if at all pubescent; inflorescence tending to corymbose..... 22. E. acris
 - ee. Involucre hirsute and not glandular.

- f. Leaves oblong-linear, shorter than the peduncles of the lower heads 23. E. elatus
- ff. Leaves very long linear and overtopping the lower heads of the racemose inflorescence 20. E. lonchophyllus

Group B

Ligules white; stem quite leafy.

- a. Middle leaves longest 19. E. hyssopifolius
- aa. Leaves gradually reduced upwards, the upper less than half as long as the lower.
 - b. Ligulate florets with a minute pappus; plants usually over 4 dm high and with many heads 18. E. annuus
 - bb. Ligulate florets with normal pappus, like the inner florets.
 - c. Leaves 3 mm wide or less; stem leaves all uniformly narrow, the upper merely shorter 6. E. pumilus
 - cc. Lower and basal leaves larger, the upper leaves gradually narrower and shorter.
 - d. Stem leaves 10-20; stems tufted from a taproot 5. E. caespitosus
 - dd. Stem leaves fewer, mostly, 5-7; tufted but not forming a taproot, the caudex merely covered by fibrous roots.
 - e. Leaves scabrous or pilose on both faces; upper leaves remote 4. E. asper
 - ee. Leaves scabrous at margin only, glabrous below and lightly pubescent above 3. E. glabellus

Group C

Ligules coloured; stem quite leafy.

- a. Middle leaves longest, 1-3 cm long 19. E. hyssopifolius
- aa. Leaves much longer and the lowest longest.
 - b. All or nearly all leaves auriculate-clasping at base 16. E. philadelphicus
 - bb. None or only the upper leaves clasping.
 - c. Ligules (1.5)-2.0-(3.0) mm wide.
 - d. Stem leaves few, lightly hirsute below, more densely so above ... 9. E. grandiflorus

- dd. Stem leaves numerous and at least the middle and lower glabrous on both faces except for the midnerve and the marginal ciliation 1. E. peregrinus
- cc. Ligules filiform, less than 1 mm wide.
 - e. Involucre pubescent; stem leaves mostly 5-7, pubescent above 3. E. glabellus
 - ee. Involucre merely finely glandular sometimes also pubescent; stem leaves much more numerous and ciliate 2. E. speciosus

Group D

Small and monocephalous with the foliage mainly basal. Less than 2 dm high. Stem leaves usually 1-3 and much reduced.

- a. Leaves finely dissected 15. E. compositus
- aa. Leaves entire to 3-toothed at apex.
 - b. Ligules yellow 11. E. aureus
 - bb. White or pink to mauve or blueish, sometimes yellowish in drying.
 - c. Involucre 9-13 mm high, heavily lanate.
 - d. Ligules white; some leaves 3-toothed at apex 12. E. lanatus
 - dd. Ligules coloured; all leaves entire 9. E. grandiflorus
 - cc. Involucre only 4-8 mm high and not lanate, although sometimes heavily pilose.
 - e. Leaves mostly spatulate, varying from narrowly obovate to oblanceolate.
 - f. Some leaves 3-5-toothed at apex 14. E. pallens
 - ff. All entire.
 - g. Long stoloniferous; herbage strigose 17. E. flagellaris
 - gg. Tufted and the stem pilose with spreading hairs.
 - h. Ligules \pm 3 mm long and very narrow; plant usually 3-5 cm high 21. E. Scotteri
 - hh. Ligules longer and \pm 1 mm wide; plant about 1 dm high 10. E. Arthuri
 - ee. Leaves long linear; ligules broad.
 - i. Leaves 2 cm long or less; stem usually scapose 8. E. radicans

- ii. Leaves much longer; stem bearing
a few leaves 7. E. ochroleucus

1. E. peregrinus (Pursh) Greene var. scaposus (T. & G.) Cronq. (E. callianthemus Greene; E. salsuginosus AA.)
-- Ligules broad, 1.5-3.0 mm wide, like an Aster. Usually monocephalous and (1) -3-4(7) dm high, with 5-10 oblong to oblanceolate leaves. Involucre densely and finely glandular. Mid summer. Open woods in the mountains.
--Y-(Aka), swAlta-BC, wUS.

In the more western typical phase the involucre is merely villous, not glandular, and the foliage tends to be more ample.

2. E. speciosus (Lindley) DC. var. speciosus --
Resembling the last, but the blue ligules narrow and the leaves more numerous. Heads solitary or more commonly 3-5. Herbage nearly glabrous except in the inflorescence, but the leaves ciliate. Ligules mauve, often drying yellowish. Mid summer. Open places in the mountain. --swAlta-sBC, US, (CA) -- Var. conspicuus (Rydb.) Boivin (E. subtrinervis Rydb. var. conspicuus (Rydb.) Cronq.)
-- More pubescent. Stem somewhat hirsute. Leaves somewhat pubescent on both faces, more densely so along the midnerve. --swAlta-sBC, nwUS.

Stat. n., E. conspicuus Rydb., Mem. N.Y. Bot. Gard. 1: 400. 1900.

3. E. glabellus Nutt. var. glabellus (var. pubescens Hooker; E. anodontus Lunell; E. asper Nutt. var. pubescens (Hooker) Breitung, f. roseata (Lunell) Breitung; E. Drummondii Greene; E. oligodontus Lunell; E. speciosus AA.)
--A common and showy, tufted prairie species, mostly 3-4 dm high, with few heads and pink filiform ligules. Leaves glabrous below, scabrous at margin, lightly pubescent above. Upper leaves 1/3-1/2 as long as the lower. Involucre hairy but not glandular. Mid summer. Frequent on better prairie soils. -- Mack, Man-BC, US.

There is a fair amount of confusion in the herbaria and in the botanical literature about this and the next species. We have therefore based our distributions solely on the specimens examined for each entity.

At DAO all the Yukon and Alaskan specimens under E. glabellus and its synonyms have been revised to E. asper. We are assuming that the material in other herbaria should be similarly revised.

Further south our typical plant is replaced by a var. viscidus (Rydb.) stat. n., E. formosissimus Greene var. viscidus Rydb., Bull. Torr. Bot. Club 28: 24. 1901, inconspicuously glandular on the involucre, the glandulosity being often somewhat hidden under the copious and longer pubescence.

4. E. asper Nutt. (var. pubescens AA., f. roseata AA.; E. glabellus var. pubescens AA.; E. oblongeolatus AA.) -- Like the last, with which it is sometimes confused, but more pubescent, the ligules white, the upper leaves more reduced, and flowering earlier. Leaves scabrous-pubescent to coarsely pilose on both faces. Upper leaves distant and much reduced, down to about 1 cm. Ligules sometimes fading pink. Early summer. Common on prairies. --Y-Aka, Man-BC, US.

Because the ligules tend to fade and dry pink, the latter colour is more common in the herbarium than in the field.

5. E. caespitosus Nutt. (E. condensatus AA.) -- Rather resembling E. asper, but smaller and in tufts from a taproot, the stem leaves more numerous, the upper not reduced so much. Taproot thickish, branched at top. Stems 2 dm high or less, mostly monocephalous. Pubescence denser and shorter than in the next and the last two, the hairs mostly 0.3-0.5 mm long. Ligules white. Mid summer. Common on steppes and hillsides. --Y-Aka, Man-BC, US.

E. Engelmanni Nelson was reported for southern Saskatchewan by Budd 1957 and 1964. It proved to be based on a Nashlyn (DAO, SCS) collection revised to E. caespitosus by Breitung in 1955. We concur.

6. E. pumilus Nutt. var. pumilus -- Daisy -- Forming an obvious series with the last three species. Leaves narrowest, long linear, and less than 3 mm wide. Tuffed from a taproot. Mostly around 1 dm high. Herbage villous throughout, especially so on the stem. Tegules lightly hirsute. Ligules white. Late spring and early summer. Sandy hills. --sS-sAlta, US.

The more western var. gracilior Cronq. is a bigger plant, commonly about twice as tall and often with 5-8 heads; pappus of shorter and often of squamiform setae.

7. E. ochroleucus Nutt. var. Scribneri (Canby) Cronq. -- A small monocephalous type with narrow leaves like the last, but the pubescence somewhat lanate at least on the involucre, the ligules usually lavender and the tegules with squarrose purplish tips. Basal leaves about half as high as the stem, the latter with few leaves, mostly 3, and much reduced. Heads showy. Involucre about 7 mm high. Early summer. Alpine meadows and summits. --swAlta, US.

Reports for the Cypress Hills, see Brittonia 6: 189. 1947, are to be discounted. They have not been confirmed by modern collections and the sole justifying sheet located, Macoun, Cypress Hills, June 28, 1894 (MO), has since been revised to E. radicans.

Typical var. ochroleucus is a taller plant, 1-4 dm high, with larger and more numerous stem leaves.

8. E. radicatus Hooker (E. peucephyllus AA.) -- Basal leaves narrow and rather short, less than 2 cm long and not over 3 mm wide. Tufted, subscapose, less than 1 dm high. Somewhat lanate towards the base of the involucre, otherwise lightly strigose throughout. Involucre about 5 mm high. Ligules \pm 2 mm wide. Early summer. Rare on dry ridges and hilltops: Old Wives Creek, Eastend, Wood Mountain, Cypress Hills, Jasper Lake and Moose Mountain Creek in Alberta. --swS-swAlta, wUS.

9. E. grandiflorus Hooker -- Ligules wide, and generally like a small E. peregrinus, but the herbage long pilose throughout, including the involucre. Only 1-2 dm high. Leaves not so wide, narrowly oblanceolate to linear, densely long ciliate, the stem leaves about 5. Ligules often turn yellowish in drying. Early summer. Alpine prairies. --wF, Mack-Aka, swAlta-eBC.

10. E. Arthurii Boivin (E. acris var. asteroides X aureus AA.; E. uncialis var. conjugans AA.) -- Similar in habit and size to the next, but the ligules narrower and not yellow. Also approaching E. Scotteri but generally larger, especially the ligules. Stem \pm 1 dm high. Rosette leaves spatulate to oblanceolate, up to 1 cm wide. Stem leaves (1)-2-(4), much smaller, the upper obscurely glandular. Pubescence and glandulosity as in the next species, except that the involucral pilosity is not so dense and the stem and the basal leaves are similarly pilose. Head solitary or rarely with a smaller head arising from the upper axil. Involucre 6-7 mm high, appressed, the tips purple. Ligules about 1 cm long and \pm 1 mm wide, at first white, soon turning rose (or perhaps light mauve), but the half-grown ligules often yellowish. Mid summer. Alpine gravel slopes. -- swAlta-swBC.

Sp. n.; E. acris X aureus sensu Cronquist 1947 et sensu Boivin 1967. Perennis, caespitosus, decimetralis et monocephalus. Pilosus omnino nisi ad summas tegularum ubi minute glandulosus. Folia rosettae 2-10 cm long, ad 1 cm lat., a spatulatis oblanceolata. Caulis pilosa et \pm glandulosa, dense et minute glandulosa in pediculo, foliis (1)-2-(4). Involucrum appressum, 6-7 mm alt. Tegulae ad basas pilosae et obscure glandulosae, ad summas purpureae et minute glandulosae. Ligulae circa 50, in primis albae, deinde roseae (vel forsan pallide lilacinae), \pm 1 cm long., \pm 1 mm lat. Flores disci lutei. Pappus 4-5 mm. Semen puberulum. Typus: Calder & Holm 24064, Twin Cairn Peak, B.C., gravelly steep slope about 7950, July 29, 1959 (DAO; isotypi: ALTA,CAN). Paratypi: Calder & Holm 24067, eodem (DAO); Calder & alii 19698 A, Quiniscoe L., Keremeos, B.C., Aug. 3, 1963 (DAO); Taylor & Ferguson, Lakit Mountain, B.C., July 15, 1958 (DAO); E. Scamman 6710, Mt. Assiniboine, B.C., Aug. 7-17, 1952

(CAN); Macoun 70350, Mount Forget-me-not, Alta., July 16, 1897 (CAN); D. Pelluet 274, Banff, Cascade Mt., Aug., 18, 1916 (CAN); D. Pelluet 210, Banff, Mt. Inglismaldie, July 17, 1916 (CAN).

A putative hybrid of acris X aureus was reported in Brittonia 6: 230. 1947 on the basis of three collections of which we have yet seen only one, the Forget-me-not specimen cited above.

So named after Dr. Arthur Cronquist, author of an excellent monograph of the genus for north America and apparently the first to have noticed the morphological originality of this taxon.

11. E. aureus Greene -- Ligules yellow, fading brown, 5-7-(10) mm long, (1.5)-2.0-(2.5) mm wide. A small monocephalous type, the stem usually unifoliate, obscurely glandular and spreading pilose. Rosette leaves more densely pubescent than the stem and with shorter and somewhat appressed hairs. Involucre (6)-7-(8) mm high, appressed to irregularly long squarrose, lightly to heavily long lanate with white to purple-black hairs. Summer. Alpine prairies and summits -- swAlta-BC, nwUS.

12. E. lanatus Hooker -- Heavily long-lanate, especially the involucre, with hairs up to 2-5 mm long. Basal leaves narrowly oblanceolate, some of them 3-toothed at apex. Ligules 1-3 mm wide, usually white. Mid summer. High alpine on talus slopes and summits. --swAlta-seBC, US.

A recent range extension to Lake Kluane in southwestern Yukon in Can. Field-Nat. 82: 114-5. 1968 proved to be based on a specimen of E. purpuratus var. dilatatus.

The monocephalous Aster alpinus is habitually similar to E. aureus and E. lanatus, but the ligules of A. alpinus are white to pinkish and 1-2 mm wide, the tegules coarser, 1-2 mm wide, tending to oblanceolate and less than 9 mm long, the leaves entire, heavily pilose and oblanceolate.

13. E. uniflorus L. var. unalaschkensis (DC.) Boivin (E. humilis Graham; E. unalaschkensis (DC.) Vier.) -- Involucre heavily lanate with dark bluish-tinted hairs, the dark blue hue being due to the deep purple cross-walls of the hairs. Less than 1 dm high and monocephalous. Ligules filiform, 3 mm long or less, white to bluish. Second half of summer. Tundra and alpine slopes. --G-Aka, L, nQ, nMan, swAlta-BC, US, Eur.

Stat. n., E. pulchellus var. unalaschkensis DC., Prodr. 5: 287. 1836. In the var. eriocephalus (J. Vahl) stat. n., E. eriocephalus J. Vahl ex Horn., Fl. Dan. 13: 2299. 1840, the involucre is lanate in white. The latter is more strictly arctic and the more southern records from B.C. are to be discounted; all B.C. specimens at

DAO, QK and MTJB, including the mount Avalanche sheet cited by Macoun 1896, have been revised to var. unalaschkensis, while other herbaria visited, including UBC and V, held no specimen at all.

There is also in B.C. a colour form that is likely to turn up in Alberta and could create some confusion: E. uniflorus var. unalaschkensis f. pallidus (Cronq.) stat. n., E. humilis f. pallidus Cronq., Brittonia 6: 239. 1947, in which the involucreal pubescence is white or essentially so. Such plants have the color of var. eriocephalus but the head size and appearance of var. unalaschkensis. In the latter the involucre is purple black, (6)-7-(9) mm high, and the tegules are all appressed or the tips sometimes lax. In var. eriocephalus the involucre is deep purple, more densely lanate, 8-9-(10) mm high, and laxer, the outer tegules tending to be long squarrose.

14. E. pallens Cronq. -- Leaves spatulate, mostly 3-toothed at apex. Low and monocephalous. Herbage long villous and inconspicuously glandular throughout, becoming yellowish lanate on the involucre. Ligules usually white. Mid summer. High alpine on shale slides. --swAlta-seBC.

Known to us only from Mount Saskatchewan (DAO), the Hanging Glacier (NY), Lake Louise (CAN), Shovel Pass (CAN), Bee Mountain (CAN), and Mount Copperstain (UBC), the latter two from B.C. We have not seen the Mount MacDonald collection.

The range was recently extended northward into western Mackenzie on the basis of a series of specimens (DAO) originally identified as E. purpuratus Greene, later revised to E. pallens and cited as such by Cody 1969. The justifying specimens have entire leaves, their involucre is heavily pilose with + purplish hairs, their papus turn purplish at anthesis, etc.; they do not differ substantially from E. purpuratus except for their consistently broader leaves which give them a superficial similarity to the closely related E. pallens. They apparently represent a hitherto unrecognized geographical variant and may be known as follows:

E. purpuratus var. dilatatus var. n., foliis latioribus et modo brevioribus, a spatulatis oblanceolatis, praecipue 2-3 mm lat. Typus: Kvale & Haggard 131, Mackenzie Mtns, Redstone River, dry soil and talus, 4 July 1963 (DAO). Paratypes from the Mackenzie Mountains as cited by Cody and also from the Quill Creek area (DAO) in Yukon. The latter was reported as E. humilis in Bot. Not. 109: 204. 1956.

15. E. compositus Pursh (var. glabratus Macoun, var. discoideus AA.: E. trifidus Hooker) -- Leaves deeply dissected into narrow segments, tripartite to tripartitid. 2 dm high or less and monocephalous. Stem

leaves few, linear, entire, reduced. Ligules usually white, variable in length. Late spring and early summer. Infrequent in open places, including steppes and alpine prairies. --G-F-(K)-Mack-Y-(Aka), NF, seQ, sS-BC, US --F. discoideus (Gray) Vict. & Rouss. --Heads discoid. --Y, NF, seQ, swS-BC, US.

Many varieties have been described. We are inclined to regard them as ecologically conditioned variants: plants from lower altitudes or from along watercourses tend to be taller, their leaves are more divided, the lobes longer, etc.

16. E. philadelphicus L. var. philadelphicus (E. purpureus Aiton) -- Most stem leaves clasping at base. Shallow-rooted and \pm biennial. Herbage long villous or hirsute. Inflorescence corymbose. Ligules pink or mauve, filiform, numerous. Early summer. Wettish ground. --swMack-Y, NF, NS-(PEI)-NB-BC, US.

Hultén 1950 extended the range to southern Yukon, but his only cited specimen was from Liard Hot Springs in northern B.C. We have however checked the following Yukon collection: E. Schoff, W. Dawson, August 1904 (TRT). A collection from Old Crow is also cited by Hultén 1967.

The more eastern var. Provancheri (Vict. & Rouss.) stat. n., E. Provancheri Vict. & Rouss., Contr. Inst. Bot. Un. Mtr. 36: 58. 1940, from the estuaries of the Saint Lawrence and of the Hudson, is smaller and essentially glabrous.

17. E. flagellaris Gray -- With long and conspicuous superficial stolons. Mostly 1-2 dm high and the stolons about as long as the stem. Rosette leaves more numerous, spatulate-oblongate. Stem leaves only 1-2 -(3) and much smaller, oblongate, similar to the stolon leaves, but the latter more numerous. Mid summer. Mountain meadows in Waterton. --swAlta-sBC, US.

18. E. annuus (L.) Pers. (E. ramosus (Walter) BSP.; E. strigosus Muhl. var. septentrionalis (Fern. & Wieg.) Fern.) -- Sweet Scabious, White Top -- Stem ridged with 3 lines of decurrence from each leaf, one for the mid-nerve and one for each margin. Shallow-rooted and \pm biennial. Herbage rough-pubescent. Leaves entire or serrate, attenuate to a sessile base, the lower petiole. Inflorescence becoming a lax and broad corymb. Central head larger, flowering first, eventually overtopped by the newer heads. Ligules white, filiform, numerous. Mid summer. Open woods. --NF, NS-BC, US, Bur.

Usually subdivided in two species on what seems to us to be an essentially arbitrary basis.

19. E. hyssopifolius Mx. var. hyssopifolius -- Wild Daisy -- Heads few or only one, borne on a very

long and subnaked peduncle. No basal leaves, lower leaves smaller, middle leaves linear, mostly 2-3 cm long, about 3 mm wide and subtending short sterile shoots, thus the plant is much more heavily leafy towards the middle. Stem glabrous to sparsely pubescent. Mid summer. River banks and wet openings in coniferous forests. --K-Mack, NF, NS, NB-Alta-(neBC), US.

A highly localized sinolaurentian variant, var. villicaulis Fern., is a smaller plant, abundantly pubescent on the stem, the bracteolate peduncle about as long as, or longer than, the leafy part of the stem.

20. E. lonchophyllus Hooker (E. minor (Hooker) Rydb.) -- Inflorescence becoming racemose. Shallowly rooted biennial. Stem hirsute. Leaves commonly about 3 mm wide, glabrous on both faces, long ciliate towards the base, linear, the lower very long linear, but some of the basal ones oblanceolate and petiolate. Ligules white, \pm 1 mm long. Mid to late summer. Pioneer on wet, disturbed soils. --K-Aka, Q-BC, US, SA.

21. E. Scotteri Boivin (E. acris var. asteroides X uniflorus var. unalaschkensis AA.; E. acris var. debilis X humilis AA.; E. Evermannii AA.; E. vagus AA.) -- Small and monocephalous, similar to E. pallens and E. uniflorus, but much less pubescent than either, at least the larger leaves glabrous above. Perennial, 2-6-(12) cm high, the stems few or commonly solitary. Leaves entire, ciliate, \pm pubescent dorsally. Stem heavily pubescent with hairs \pm 0.5 mm long, also finely glandular. Involucre rather small, only 5-6 mm high; tegules ciliate, densely and finely glandular on back, densely pilose at base, sometimes sparsely pilose along the midnerve. Ligules pink, \pm 3 mm long, \pm 0.3 mm wide, rare alpine in Banff and Jasper parks. --swAlta-seBC.

Sp. n. sectionis Trimorphaeae. Perennis. Radix brevis, caudicibus nullis. Caulis saepius solitarius, 2-6-(12) cm alt., dense et minute glandulosus, valde pilosus, pilis \pm 0.5 mm, lucidis. Folia rosettae petiolata, a spatulatis anguste oblanceolata, ciliata et inferne \pm pubescentia, superne glabrescentia. Involucrum 5-6 mm alt., viride. Tegulae circa 0.5 mm lat., sensim acuminae. Ligulae roseae, \pm 3 mm long., (0.2)-0.3-(0.5) mm lat., 40-100 in capite. Flores filiformes perpaucae. Flores disci 4-5 mm long., tubo \pm 1 mm long., luteae, lobis brunnescentibus vel purpurascenscentibus. Pappus 3-4 mm long. Semen \pm 2 mm long., anguste lanceolatum, compressum, puberulens.

Typus: G.W. Scotter 9796A, Alberta, Jasper Nat. Park, Maligne Lake, alpine, Aug. 8, 1968 (DAO). Paratypes: G.W. Scotter 9776 & 9801, eodem (DAO); J.A. Calder 24031, Lake Agnes, 1959 (DAO); L. Jenkins 7809, Jasper

Park, from Maligne Lake to Lorraine Lake, el. about 6000 feet, common among boulders on open slope, Aug. 6, 1957 (DAO); E.J. Hermann 12865, mossy north shore of Lake Louise, alt. 5,700 ft., July 18, 1956 (ALTA, CAN); N.B. Sanson 1030, Larch Valley, Alta., 1923 (NY); J. Macoun 11002, 78762, B.C., Kicking Horse Lake, 1886 (CAN, NY); Eastock, Yoho, B.C., 1927 (DAO); Calder & Holm 24066B, 24067, Twin Cairn Peak, BC., July 29, 1959 (DAO).

From its relatives our new species may be distinguished by a number of characters, such as the very small involucre. Its very narrow and short ligules will readily separate it from most other small monocephalous species in our area. Its light pubescence also readily sets it apart from most other small alpine species. The length of the pappus will separate it from small and monocephalous specimens of E. acris. In the latter ligules are usually white and the disk florets are conspicuously overtopped by the pappus while in E. Scotteri the pappus is shorter and slightly overtopped by the disk florets.

Despite its assignment to section Trimorphaea, it seems that E. Scotteri is most closely related and quite similar to E. uniflorus. However the latter is heavily tomentose on the involucre with much longer hairs, its tegules are longer and purplish, and its pappus is somewhat longer than the disk florets.

Though rarely collected, this new entity has been known for quite some time and has gone through a surprisingly elaborate series of avatars.

The first collection may have been that of Macoun at Kicking Horse Lake in 1886; it was identified as E. acris (CAN) or E. uniflorus (NY) and reported as the latter the following year. But Macoun in 1897 mentions it again as his only specimens of E. alpinus. In 1923 a Sanson collection from Larch Valley was also identified, probably at NY, as E. uniflorus. On page 239 of his monograph Cronquist refers casually to hybrids of E. acris var. debilis X humilis. This report was investigated in 1965 and turned out to be based on the above two collections. Borrowed and examined in 1966, they proved to be rather intermediate morphologically to the postulated parents and were incorporated in our Énumération of 1966 as E. acris var. asteroides X uniflorus var. unalaschensis. Hermann collected it at Lake Louise in 1957, identified it to the partly glabrous E. Evermannii, and distributed duplicates with a note that it was new to Canada. His collection was the basis for a last minute inclusion of the latter name in the Flora of Alberta of Moss 1959, and in our Énumération of 1966. A Jenkins collection submitted for identification in 1958 was estimated to be an unusually depauperate specimen of E. acris and was so identified.

There is also in one of the Botanical Congress guide books a mention by Porsild 1959 of E. vagus from Mt. Temple. In our 1962 survey of the genus at CAN there were no specimens under this names and a cursory check in 1969 and 1971 gave similarly negative results. In the absence of justifying specimens, noticing the absence of the putative hybrid and of E. Evermannii from Porsild's list, considering that E. vagus would be far out of range in the Canadian Rockies, and considering that it is generally similar to E. Scotteri in the same manner as the latter is similar to E. Evermannii, we are tentatively referring the Canadian report of E. vagus to E. Scotteri.

Thus, this attractive little species has already accumulated a complex history and a rather large and unwieldy series of conflicting identifications.

22. E. acris L. var. asteroides (Andrz.) DC. (var. debilis Gray; E. angulosus Gaudin var. kamtschaticus (DC.) Hara; E. droebachensis O. Mueller) -- Farewell-to-Summer (Vergerette) -- Ligules short and inconspicuous like the last two and the next, but the involucre minutely glandular. Herbage otherwise ± pubescent or hirsute. Leaves oblanceolate to linear, up to 1 cm wide. Heads rarely solitary, usually few in a variable inflorescence, commonly corymbose, sometimes paniculate or thyrsoid. Peduncles widely spreading. Mid summer. Wettish open spots in coniferous forests. -K-Aka, L, NB-BC, (US, Bur).

Many other varieties also occur in Eurasia.

23. E. elatus (Hooker) Greene (E. acris L. var. elatus (Hooker) Cronq.) -- Obviously related to the last. Involucre hirsute, not glandular. Heads only one or few on nearly erect peduncles in a racemose inflorescence. Usually smaller and with fewer stem leaves. First half of summer. Open wet ground on light soils. --K-Aka, L-NF, Q-Man-(S)-Alta-BC.

Smaller specimens may be monocephalous and should not be confused with E. uniflorus. In the latter the somewhat larger head is very heavily lanate with flexuous hairs mostly 2-3 mm long. But in E. elatus the involucral pubescence is much less dense and the shorter hairs are all or mostly under 1 mm.

24. E. CANADENSIS L. var. CANADENSIS (Conyza canadensis (L.) Cronq.; Leptilon canadense (L.) Britton) -- Fireweed, Horseweed -- (Fausse Camomille, Herbe des Français) -- Heads small and usually very numerous in a ± cylindric inflorescence. Annual. Leaves numerous, linear. Herbage villous. Mid to late summer. Frequent on disturbed soil, especially in sandy or gravelly. -- Mack, (NF)-SPM, NS-BC, US, SA, Bur, (Oc).

Reputedly native in Canada but we are unconvinced. From coast to coast we have often come across it; every time it had the usual weedy behavior of an alien invading disturbed soils. Nowhere did it recur regularly as a normal component of a natural habitat.

A coastal plain variant, var. pusillus (Nutt.) stat. n., E. pusillus Nutt., Gen. 2: 148. 1818, is glabrous or nearly so and its tegules are purple-tipped.

16. PSILOCARPHUS Nutt.

With the general presentation of an Antennaria, or better a Gnaphalium, but the leaves opposite. Pappus lacking. Heads without involucre but subtended by a few foliage leaves. Each floret enclosed by a woolly bract.

1. P. elatior Gray -- Woolly Heads -- Woolly annual resembling a Gnaphalium with opposite leaves. Less than 1 dm high, simple to dichotomously branched. Heads small, rounded, sessile, overtopped by a number of subtending foliage leaves. Mid summer. Dried slough bottoms, rare: Redcliff. --swAlta-swBC, nwUS.

17. ANTENNARIA Gaertner

PUSSY-TOES

White-woolly herbs with dioecious flowers. Heads discoid, but rather showy because the tegules are petaloid in the upper half, white-woolly in the lower half. Pappus of bristles, these somewhat clavate in the staminate plants.

This genus has been much studied by various taxonomists for some three quarters of a century now and we have not yet had a chance to evaluate some of the many described entities. At least the following have been reported for Alberta and should eventually be added to our text either as additional taxa or as additional synonyms.

Antennaria acuta Rydb. (= Rydberg 1917).

Antennaria albescens E. Nelson (= Rydberg 1917).

Antennaria alborosea Pors. (= Forsild 1950).

Antennaria Sansonii Greene (= Rydberg 1917).

a. Inflorescence an open raceme 5. A. racemosa
aa. Inflorescence a corymb, or sometimes a solitary head.

b. Stem very short or vestigial, not overtopping the basal leaves 17. A. dimorpha

bb. Much taller.

c. Basal and lower leaves 3-15 cm long, lanceolate to linear, acute Group A

cc. Shorter and relatively wider, usually rounded at tip.

- d. Tegules coloured in the upper half, greenish, straw, brownish or pink ... Group B
- dd. Milky-white to light sulphur-yellow.
 - e. Leaves rather large, the larger ones over 5 mm wide and usually glabrous or glabrescent above .. Group C
 - ee. Rather narrow, rarely over 5 mm wide, grayish or whitish tomentose, above Group D

Group A

Tufted or stoloniferous but the stolons burried. Rather large species with the leaves all or mainly cauline. Rosette leaves, if present, erect.

- a. Tegules glabrous to the base or the outer ones somewhat tomentose near the base..... 3. A. luzuloides
- aa. Tegules heavily tomentose in the lower 1/3; heads larger.
 - b. Tufted; upper stem leaves at least half as long as the lower 4. A. lanata
 - bb. Stoloniferous; upper stem leaves much reduced and many times shorter than the lower.
 - c. Tegules not white at tip, or the white tip less than half the length of the tegule 1. A. pulcherrima
 - cc. White tips longer, more than half the length of the tegule 2. A. anaphaloides

Group B

Tegule tips variously coloured. Rosette-forming species.

- a. Tegules pink 11. A. rosea
- aa. Straw-coloured to brownish or greenish.
 - b. Tegules pale to dark brown above the middle.
 - c. Involucre 6-7 mm high.
 - d. Basal leaves 5-10 mm wide 15. A. Russellii
 - dd. Narrower 18. A. alpina
 - cc. Involucre only 4-5 mm high; plants smaller 16. A. umbrinella
 - bb. Tegules with dark-coloured and greenish tips.
 - e. Involucre 8-10 mm high; leaves very narrowly oblanceolate.
 - f. Herbage grayish-tomentose ... 20. A. angustata
 - ff. Green and nearly glabrous ... 21. A. glabrata

- ee. Heads smaller, the involucre only
4-6-(7) mm high; leaves oblanceolate,
mostly 3-5 mm wide.
 - g. Typically monocephalous; tegules
strongly squarrose 19. A. monocephala
 - gg. Mostly with 3-5 heads; tegules
appressed 18. A. alpina

Group C

Rosette forming species. Tegule tips all, or at least the inner, white, or in one species light sulphur-yellow. Basal leaves rather broad, the larger ones mostly over 1 cm wide and mostly glabrous or glabrescent above.

- a. Involucre 4-7 mm high.
 - b. Basal leaves ovate or obovate, 1-2 cm wide when full grown 7. A. Denikeana
 - bb. Spathulate or oblanceolate and all or mostly 0.5-1.0 cm wide 9. A. neodioica
- aa. Involucre 7-11 mm high.
 - c. Rosette leaves 1.5-5.0 cm wide ... 6. A. Parlinii
 - cc. All or mostly narrower.
 - d. Basal leaves cuneate-oblanceolate, gradually narrowed at base, not distinctly petiolate; new rosettes not developed until fruiting time 8. A. Howellii
 - dd. Blade ± obovate and abruptly narrowed to a winged petiole; new rosettes present at flowering 9. A. neodioica

Group D

Like the last, but the leaves more tomentose. Whittish or grayish above, and narrower, all or mostly less than 5 mm wide.

- a. Heads rather large; involucre 7-10 mm high 13. A. aprica
- aa. Heads smaller; involucre 5-7 mm high.
 - b. Reduced plants, less than 5 cm high 13. A. aprica
 - bb. Usually well over 1 dm high.
 - c. Basal leaves obovate-spathulate, the blade less than 3 times as long as wide 10. A. parvifolia
 - cc. Narrowly oblanceolate.
 - d. Middle and upper stem-leaves ending in a scarious flat and glabrous appendage; tegule tips dirty white... 14. A. isolepis

dd. All or nearly all stem-leaves subulate at tip; tegules tips white ...

..... 12. A. corymbosa

1. A. pulcherrima (Hooker) Greene -- Our largest species and with the longest foliage leaves. Stoloniferous, but the stolons much elongate and underground, the plant thus not carpet-forming. Tomentose throughout. Stem 3-6 dm high. Lower and basal leaves petiolate, narrowly lanceolate, the blade 5-15 cm long. Involucre 7-9 mm high. Tegules dirty green or dirty brown to white at tip, the basal part green and white-tomentose, the middle part dark brown. Just before mid summer. Wet and open clay soils in the coniferous forest regions. --K-Aka, Q-BC, wUS, (Bur).

2. A. anaphaloides Rydb. --Very much like the last but somewhat smaller and the tegules broader and more conspicuous, the white tips being more than half the length of the tegule. Involucre smaller, 5-7 mm high. Early summer. Mountane prairies and open Lodgepole woods: Cypress and Rockies. --Aka, swS-BC, nwUS.

3. A. luzuloides T. & G. -- Resembles the last two, but the heads smaller and less pubescent. Stem 2-4 dm high. Short stoloniferous. Leaves less than 1 cm wide, mostly linear. Heads numerous. Involucre \pm 4 mm high, lanate at the very base only. First half of summer. Rocky alpine slopes in Waterton. --swAlta-sBC, nwUS.

4. A. lanata (Hooker) Greene -- With the habit of the last 3 and with elongate lanceolate leaves, but loosely tufted and loosely lanate throughout, especially so in the inflorescence. 1-3 dm high. Ligule tips squarrose, brown to greenish black. Mid summer. Alpine meadows. --swAlta-BC, nwUS.

5. A. racemosa Hooker -- Inflorescence a loose raceme, the lowest peduncle 2-3 cm long. With long superficial stolons. Basal leaves ovate, green above and mostly 2-3 cm wide. Stem leaves oblong-lanceolate. Early summer. Montane Pine woods. -- swAlta-BC, nwUS.

6. A. Parlinii Fern. var. Parlinii (A. munda Fern.) -- Rosette leaves rather large, obovate, mostly 2-3 cm wide. 2-4 dm high. Heads 4-8 in a rounded corymb. Long stoloniferous and forming dense carpets, the new rosettes not fully grown till fruiting time. Dry open places; rare: Indian Bay. --NS, Q-seMan, US.

In the magnilacustrine var. Farwellii (Greene) Boivin the leaves are cuneate obovate, \pm truncate, and the pappus is somewhat shorter, about 6 mm long.

7. A. Denikeana Boivin (A. plantaginifolia AA.) -- Similar to A. Parlinii, but the heads smaller and the

leaves permanently grayish tomentose above. Involucre only 4.0-4.5 mm high. Late spring. Dry fields. -- sMan.

A. plantaginifolia has often been used sensu amplo, especially by the older authors, and the justifying sheets must be examined in each case when attempting to dispose of old records. Its Canadian distribution appears to be restricted to southwestern Quebec and southern Ontario. Of the old collections by Dawson's party we have examined sheets from Emerson (TRT) and Duffering (TRT). They were revised partly to A. neodioica, partly to A. Howellii var. campestris. Old collections by Bell (QK) have been revised partly to A. neodioica, partly to A. Howellii var. athabascensis. The more recent report of Scoggan 1957 was partly based on A. Denikeana.

8. A. Howellii Greene var. Howellii (A. neglecta Greene var. Howellii (Greene) Cronq.) -- One of the 3 common species, the one which forms loose carpets with the leaves green and glabrous above. 2.0-4.5 dm high, the basal leaves 2.0-4.5 long and (0.8)-1.0-1.5 cm wide. Middle and upper stem leaves commonly ending in a scarious appendage. Spring. Dry Pine woods and mixed forests. --sY, S-BC, US -- var. athabascensis (Greene) Boivin -- Less than 2 dm high at flowering, but elongating to 3.5 dm at maturity. Rosette leaves narrower, mostly 2-3 cm long, but only 0.5-1.0-(1.2) cm wide. Middle and upper stem leaves ending in a scarious appendage. Prairies and Aspen bluffs. More or less transitional to the next species. --sMack, Man-BC -- Var. campestris (Rydb.) Boivin (A. campestris Rydb.; A. canadensis AA.; A. neglecta AA.; A. racemosa AA.) -- Smaller and the stem leaves with scarious or subulate tips. Less than 2 dm high. Rosette leaves shorter, only 1-2 cm long and 0.5-1.0 cm wide. Steppes and dry hills. --sMack, wO-BC, US.

In A. Howellii Greene f. concolor (Piper) stat. n., A. concolor Piper, Contr. US, Nat. Herb. 11: 604. 1906, the leaves remain somewhat tomentose above. We know of no specimen from our area and we suppose that an Alberta report by Moss 1957, queried by Boivin 1967, was merely a speculative entry.

A. Howellii Greene var. athabascensis (Greene) stat. n., A. athabascensis Greene, Ott. Nat. 19: 197. 1906.

A. Howellii Greene [May 19, 1897] var. campestris (Rydb.) stat. n., A. campestris Rydb., Bull. Torr. Bot. Club 24: 304. [June 29, 1897].

9. A. neodioica Greene var. neodioica (A. neglecta Greene var. attenuata (Fern.) Cronq.); A. obovata E. Nelson; A. oxyphylla Greene; A. petaloidea AA.) -- Like the last, but the leaf blades shorter, more abruptly contracted into a winged petiole, more permanently tomentose above. Long stoloniferous and forming loose carpets with

the new rosettes already full grown (but not fully spread out) at flowering time. Leaves up to 1.5 cm wide, but more commonly less than 1 cm. Winged petiole at least half as long as the blade. Involucrum 7-9 mm high. Late spring. Dry, open woods. --NF-SPM, NS-BC, US -- Var.

Randii (Fern.) Boivin (A. canadensis Greene; A. neglecta Greene var. Randii (Fern.) Cronq.) -- Leaves glabrous above, even when young -- (NF, NS-PEI)-NB-Q-(nMan, neUS).

Var. Randii (Fern.) stat. n., A. canadensis Greene var. Randii Fern., Proc. Bost. Soc. Nat. Hist. 28: 246. 1898.

Further west there is also a local variant, var. chlorantha (Greene) stat. n., A. chlorantha Greene, Ott. Nat. 18: 38. 1904, with a more deeply coloured involucre, the tegules being of a rather dark green towards the tip. Still known only from Chilliwack, B.C.

All Manitoba specimens (DAO) reported as A. petaloidea Fern. have since been revised to A. neodioica.

An Alberta report of A. petaloidea by Raup 1935 was based on a sheet from Pine Lake (CAN) since revised to A. Howellii.

An Alberta report of A. canadensis by Raup 1935 has not been investigated but is held to be improbable.

10. A. parvifolia Nutt. var. parvifolia (A. arida Nelson; A. microphylla Rydb.; A. nitida Greene; A. rosea Greene var. nitida (Greene) Breitung) -- Just before anthesis the stem is recurved downwards and the inflorescence is drooping, soon to become erect. Tegules tips often tinted in sulphur yellow. One of the 3 common species, the one with the smaller leaves and the denser carpet, the stolons being very short. Stems 1-3 dm high, the herbage whitish or grayish tomentose throughout, including the upper leaf surfaces, somewhat glandular in the inflorescence. Basal leaves (0.5)-0.8-1.0-(1.5) cm long, 6 mm wide or less, spatulate, the stem leaves 1.0-1.8 cm long. Involucre 5-7 mm high. Staminate plant similar, somewhat smaller and about as common as the pistillate plant. (Staminate plants are rare or unknown for most of our species.) Early summer. Common in prairies and steppes. --K-Aka, O-BC, US -- Var. bracteosa (Rydb.) Boivin -- Larger, 3.0-4.5 dm high, the stem leaves \pm 2 cm long and the involucre \pm 7 mm high. Rare, Cypress Hills. --swS-seAlta, (US).

On the application of the names A. aprica, A. microphylla, A. parvifolia and A. rosea, see Boivin 1951 and 1953.

11. A. rosea Greene var. rosea -- Conspicuous by its tegules variously tinted in light pink to cherry red. Stems 1-4 dm high, the inflorescence nodding before anthesis like the last. Basal leaves (0.8)-1.5-2.0-(2.5) cm long, including the ill-defined petiole, oblanceolate,

mostly 2-3 mm wide and nearly erect; stem leaves linear, \pm 2 mm wide. Otherwise similar to A. parvifolia. Early summer. Open woods and prairies. -- K-Aka, wcQ-nO-BC, US -- F. decipiens Boivin -- Tegules white. A rare local form not to be confused with the previous species. Note the narrower and more erect leaves of A. rosea. -- ~~Alta~~-BC -- Var. imbricata (Nelson) Boivin -- Leaves larger, the basal ones obovate-spatulate, 4-6 mm wide; stem leaves oblong-lanceolate, 3-5 mm wide. Cypress Hills and Rockies. --swS-Alta, US.

12. A. corymbosa E. Nelson -- Rather similar to the last, but the tegules not tinted and the basal leaves narrower and more elongate, linear-oblongate and commonly 2.5-4.0 cm long. Early summer. Open montane forest. --swS-Alta, wUS.

Perhaps only a minor variant to be consolidated with A. rosea f. decipiens.

13. A. aprica Greene var. aprica (A. parvifolia sensu Cronq., etc.; A. parviflora sphalm.) -- The lowest of the 3 common species, short, with large heads, and leaves equally tomentose on both faces. Stem commonly \pm 1 dm. high, stiffly erect. Basal leaves (0.6)-1.0-(1.5) cm long, cuneate-oblongate. Involucre 7-10 mm high. Late spring. Common in prairies and steppes. --wO-BC, US, (CA) -- F. roseoides Boivin (A. parviflora Nutt. f. roseoides (Boivin) Breitung) -- Tegules pinkish at tip. -- S-BC, US -- F. brunnea Boivin (A. parvifolia Nutt. f. brunnea (Boivin) Breitung) -- Tegules strawbrown at tip. Boisé Coteau. -- swS -- Var. minuscule Boivin -- Smaller, only 1-3 cm high, and the involucre only 5.5-7.0 mm high. Rare: Touchwood Hills. --sS.

Var. minuscule (Boivin) stat. n., A. minuscule Boivin, Nat. Can. 80: 122-123. 1953.

14. A. isolepis Greene -- Differentiated from the last 4 by the scarious appendages of its middle and upper stem leaves. Said appendages largest and most noticeable of all our species. Stem 1-2 dm high; herbage grayish-tomentose. Basal leaves \pm 1 cm long, oblongate. Perhaps nodding before anthesis. Tegule tips transitional to the subsequent species: the outer squarrose and brownish, the inner white but somewhat finely speckled in brown. Mid summer. Dry, sandy or gravelly arctic tundra. -- K-Mack-(Y)-Aka, L. nQ, (nMan, nBC).

15. A. Russellii Boivin (A. oxyphylla AA.) -- Tegule tips golden brown to straw-coloured. Otherwise similar to A. neodioica, the leaf blades obovate and abruptly narrowed to a winged petiole, the upper surface permanently tomentose. Heads slightly smaller, the involucre only 6-7 mm high. Early summer. Dry hills and open woods: Cypress Hills. --swS, wUS.

The name A. oxyphylla has been used in a rather wide variety of meanings. Greene's original description seems to correspond to a phase of A. neodioica in which the leaves are more heavily tomentose above. Russell 1954 and Breitung 1954 were dealing with A. Russellii. Porsild 1950 seems to refer to a minor segregate of A. rosea, at least as far as his northern-most specimens are concerned. And our own 1960 report for Cranbrook in British Columbia was based on specimens we now place in A. Howellii var. athabascensis. Raup's 1936 and 1947 reports have not been investigated.

Sp. n., A. oxyphylla sensu Russell 1954, sensu Breitung 1954. Superficialis et coloniam laxam evolvens. Caulis 2-3 dm alt. Stolones procumbentes, radicanes, 2-6 cm long., rosettam novam gaudentes aetate florendi. Folia inferne albo-tomentosa, superne griseo-tomentosa; rosularia 1.5-2.5 cm long., late radiantia, lamina obovata 5-10 mm lat., ad summas rotundata, mucronulata, ad basas in petiolum alatum angustata; caulinarum ad summas subulata, nec appendiculata nisi interdum superiora 1-2. Inflorescentia rotundata-corymbosa ex 5-6 capitulis. Involucrum 6-7 mm alt., tegulis ad summas brunneo-stramineis. Planta mascula mihi ignota. Type: A.J. Breitung 4414, Cypress Hills Park, open Pine and Aspen woods, July 7, 1947 (DAO).

16. A. umbrinella Rydb. (A. aizoides Greene) -- Heads rather small and the tegule tips brownish. About 1 dm high, the leaves equally grayish-tomentose on both faces. Stolons short, forming small dense carpets of rather short and broad leaves, mostly obovate. Lower stem leaves similar, but narrower. Involucrum 4-5 mm high. Late spring. Gravel slopes and shale slides in the mountains: Cypress Hills and Rockies. --swS-seBC, US.

17. A. dimorpha (Nutt.) T. & G. -- Scapose or nearly so and forming dense and exclusive patches. Perennial from a taproot. Basal leaves 1.5-2.5 cm high, oblanceolate, overtopping the single head. Tegule tips brownish. First half of spring. Eroded steppes, often pioneering. Rare. --swS-sAlta-BC, wUS.

18. A. alpina (L.) Gaertner var. alpina -- Tegule tips greenish to dirty green or dark green. Short stoloniferous and forming small and dense carpets. Stem (0.5)-1.0-(1.5) dm high. Herbage grayish tomentose, the rosette leaves discolour, very densely tomentose below, but glabrescent above, the older ones greenish and glabrous or nearly so on the upper surface. Middle and upper stem leaves conspicuously appendiculate. Involucre usually 5-6 mm high. Mid summer. Alpine meadows and summits, rare. -- G-(F-K, L), nQ, swAlta, Eur -- Var.

canescens Lange (var. media (Greene) Jepson; A. canescens (Lange) Malte; A. media Greene; A. mucronata E. Nelson; A. subcanescens Ost.) -- Leaves permanently whitish tomentose on both faces. Tegules tips brown to greenish, as in var. alpina. Much more common. -- G-(F)-K-Mack-(Y)-Aka, L, Q, swAlta-BC, wUS.

19. A. monocephala DC. var. monocephala -- Tegules tips also greenish and otherwise much as in A. alpina, but typically monocephalous, sometimes with a second and smaller head. Stolons short, tending to form small tufts, or the plants sometimes solitary. Rosette leaves green and glabrous or nearly so above. Tegules strongly squarrose and very dark green. Leaves whitish-lanate below, glabrous or nearly so above. Early summer. High alpine. -- wMack-Aka, swAlta-eBC.

In the Alaskan var. exilis (Greene) Hultén the tufts are laxer, the stolons being up to 5 cm long, and the leaves are white tomentose on both faces, with a more elongate petiole.

20. A. angustata Greene -- Tegule tips greenish like the last two, but the heads larger and the narrower leaves longer. Not stoloniferous, but tufted, the new shoots being short and ascending. Leaves linear-oblongate, tomentose, commonly glabrescent above. Heads usually solitary. Involucrum 8-10 mm high, lightly to heavily lanate towards the base. Early summer. Alpine slopes. --(G)-F-Mack-(Y-Aka), L, nQ, swAlta-(eBC).

21. A. glabrata (J. Vahl) Greene -- Similar to the last, of which it is perhaps only a rare phenotype. Herbage, and especially the rosette, much less pubescent, green and glabrous to merely lightly tomentose. (Early summer?). Wet alpine slopes. -- G-(F-K)-Mack, swAlta.

18. ANAPHALIS DC.

EVERLASTING

White-woolly and the tegules petaloid like the last and the next, but the flowers unisexual; the pistillate and staminate present together in each head.

1. A. margaritacea (L.) B. & H. (var. subalpina Gray) -- Straw-Flower, White Daisy (Mortelle, Immortelle) -- Like a large Antennaria without basal leaves but with long and numerous stem leaves. Stoloniferous, 3-8 dm high, virgate. Leaves 5-15 cm long, linear-lanceolate, green and often floccose above, revolute. Heads numerous and showy in a corymbiform inflorescence. Tegules milky-white, strongly contrasting with the darker center. Mid summer. Light soils in semi-open Coniferous forests. --wMack, Aka, L-SPM, NS-BC, US, Bur.

Quite local across our area: southeastern Manitoba, Cypress Hills and Rocky Mountains. We were unable to substantiate a report from Cutknife, Sask., by Fraser 1944, Russell 1954, and Breitung 1957.

Many varieties have been proposed, based mainly on size of plant, number, size and width of leaves, and density of pubescence. We are not yet convinced that these characters are sufficiently correlated inter se and with a well defined and individualized distribution to justify taxonomic recognition. Some of the variation could be ecologically conditioned.

19. GNAPHALIUM L.

CUDWEED

Lanate and with petaloid tegules like the last two. Not dioecious. All flowers either perfect or pistillate and both types present in each head. Our species all annual.

- a. Stem simple below the terminal corymb or panicle.
 - b. Stem glandular-viscid 3. G. viscosum
 - bb. White-tomentose, not glandular.....
 - 4. G. microcephalum
- aa. Stem much branched and leafy under the head clusters.
 - c. Tegules acutish and dirty green to brownish in the upper half 1. G. uliginosum
 - cc. Rather rounded at tip, the inner hyaline in the upper half 2. G. palustre

1. G. ULIGINOSUM L. -- Wartwort -- Branchy annual with numerous small terminal clusters much overtopped by the surrounding foliage leaves. 2 dm high or less. Tomentum on the stem thinner than the thickness of the stem itself. Leaves oblanceolate to long linear. Summer. Infrequent in exundated places. -- (G), Mack-(Y-Aka), L-SPM, NS-BC, US, Eur.

Specimens have been checked from Angusville, Rose-town Paradise Hill, Saskatoon, Medicine Hat and Fort Saskatchewan. Such sporadism almost surely denotes an introduced entity.

2. G. palustre Nutt. -- Similar, more woolly and the leaves broader. Tomentum looser, especially upwards, becoming thicker than the width of the stem and branches. Leaves ovate to oblanceolate, becoming shorter and broader in the inflorescence and not overtopping the heads so much. Mid summer. Marshy depressions. -- S-BC, US.

3. G. viscosum HBK. (G. Macounii Greene) -- (Poverty-Weed) -- Leaves oblinear, discolour, decurrent for 3-10 mm. Tufted biennial. Stem and upper leaf surfaces densely glandular-pubescent, lower leaf surfaces

and inflorescence white tomentose. Heads numerous in a dense and lightly coloured inflorescence. Tegules light yellow to nearly hyaline. Rare in forest openings: Carbondale. -- NS-O, swAlta-BC, US.

G. Macounii was reported by Budd 1957 and 1964 from southern Manitoba, but this may have been a lapsus calami as the only sheet found at SCS was the Carbondale specimen described above.

4. G. microcephalus Nutt. (var. thermale (Nelson) Cronq.) -- Tufted perennial with numerous, small, whitish heads. Stems 3-4 dm high, + decumbent at base. Stem leaves gradually shorter upwards and grading into the short ultimate bracts subtending the heads. Just after mid summer. Dry foothill gravels in Waterton. --swAlta-sBC, wUS.

Re G. obtusifolium L. reported from Manitoba by Gleason 1952, see comment under Buchloë dactyloides. A further report by Budd 1957, 1964 is presumably based on Gleason's as no corresponding specimen could be located at SCS in 1967.

20. ADENOCAULON Hooker

Involucral bracts few, only 4 or 5. Heads without ligules, without chaff and without pappus.

1. A. bicolor Hooker -- Pathfinder, Silver-Green -- Leaves large, deltoid-cordate and lanate below, rather suggesting those of Petasites vitifolius. Stem leafy. Petioles winged. Inflorescence a diffuse panicle, almost bractless. Achenes few and not enclosed by the very small and reflexed involucre. Mid summer. Moist montane woods in Waterton. --(O), swAlta-sBC, US.

21. IVA L.

MARSH-ELDER

Similar to the next two, but the involucre not becoming indurated nor spinescent at maturity. Heads small and discoid with a chaffy receptacle. Pappus lacking. Main leaves opposite, the upper alternate.

a. Heads solitary in the axils..... 1. I. axillaris
 aa. Heads numerous in a panicle of racemes
 2. I. xanthiifolia

1. I. axillaris Pursh var. axillaris -- Poverty-Weed -- Heads solitary and drooping on recurved pedicels. Branchy herb with lanceolate to linear leaves, the main ones opposite, the upper alternate. Herbage inconspicuously glandular, not punctate. Leaves nearly glabrous on both faces, becoming pubescent towards the edges. Mid summer. Alkaline soils, sometimes aggressive in cultivated or disturbed ground. -- sMan-Alta, cUS -- Var. robusta

tior Hooker -- Herbage glandular-dotted in yellow or brown and abundantly pubescent. Leaves lanceolate to elliptic. Wood Mountain. -- scS, scBC, wUS.

2. I. xanthiifolia Nutt. (Cyclachaena xanthiifolia (Nutt.) Fres.) -- Coarse annual with large, ovate and irregularly serrate leaves. Herbage \pm scabrous, but the stem smooth below. Leaves paler beneath, the main ones opposite, the upper alternate. Late summer. Exundated shores of saline waters, invading disturbed soils and waste places. -- NS-BC, US, Eur.

Apparently native around sloughs from southwestern Saskatchewan westward to the Rockies, a casual adventive elsewhere.

22. AMBROSIA L.

RAGWEED

Heads unisexual, the staminate ones in long terminal racemes, the pistillate ones axillary and strongly modified, containing a single flower without corolla, the tegules fused together into a pod-like bur which is acicular in the upper part, and becomes semi-woody. Heads rayless and with filiform chaff on the receptacle. Pappus none.

- a. Leaves both trifid and serrate or merely serrate 1. A. trifida
- aa. Leaves pinnatifid to bipinnatifid.
- b. Perennial; leaves opposite 3. A. psilostachya
- bb. Annual; leaves all or mostly alternate.
- c. Involucre of the staminate flowers entire 2. A. artemisiifolia
- cc. Deeply lobed; stem acicular-hispid .. 4. A. acanthicarpa

1. A. trifida L. var. trifida (f. integrifolia (Muhl.) Fern.) -- Great Ragweed, Buffalo-Weed (Grande herbe à poux) -- Main leaves large, opposite and trifid. Tall and coarse annual, usually little branched. Leaves sometimes ovate and merely serrate. Petiole winged. Corners of the achene prolonged into short points. Second half of summer. Riverward edge of galerie-forests and casually as a weed undisturbed places. -- NS-BC, US, Eur.

Seems native from southeastern Saskatchewan eastward to southwestern Quebec; an uncommon adventive elsewhere.

Leaf shape is rather variable. Stem leaves are typically trilobed to tripartite. Upper leaves, lower leaves, and leaves from depauperate individuals may be unlobed (= f. integrifolia). South of us there is another variant, var. texana Scheele, in which the petioles are

wingless and the achenes tuberculate rather than acicular on the angles.

2. A. artemisiifolia L. (var. elator (L.) Des-courtils, f. villosa Fern. & Griseb; A. elator L.) -- Ragweed, Hogweed (Herbe à poux, Roupie) -- An annual inconspicuous except for the long terminal racemes of staminate heads. Leaves \pm bipinnatipartite, narrowly decurrent on the petiole, the lobes mostly 2-3 mm wide, the pubescence short and nearly appressed. Stem pubescence very long, spreading hirsute. Fruit with a row of spreading spines near the top, these not very sharp. After mid summer. Common as a weed, but also native around dessicating sloughs west of the Missouri Coteau. -- NF, NS-BC, US (CA), SA, Eur.

3. A. psilostachya DC. var. coronopifolia (T. & G.) Farw. (A. coronopifolia T. & G.) -- Much like the last, but perennial by deeply buried rhizomes and the leaves not so deeply divided. Stem leaves all opposite, merely pinnatipartite, the lobes mostly around 5 mm wide, decurrent on the winged petiole. Stem pubescence like that of the leaves, only a little longer. Fruit sometimes spineless, but mostly with a crown of not very long and not very sharp projections. Mid to late summer. Occasional in somewhat alkaline prairies and shores. NS-PRI, Q-BC, (US, CA), Eur.

Apparently present in Alberta only as a railway weed at Craigmyle where it was collected by Brinkman in 1922 (ALTA). This collection is the justification of the report by Moss 1959. An earlier report by Groh 1944 was based on Macoun 949, Red Deer Lakes, July 21, 1879 (DAO). But the specimen belongs to A. artemisiifolia and the Red Deer Lakes (or Coteau Lakes) are in Saskatchewan, 10-15 miles southwest of Outlook.

The typical phase is Mexican and is reported to be more finely pubescent on the staminate involucre.

4. A. acanthicarpa Hooker (Franseria acanthicarpa (Hooker) Cov.) -- Sandbur -- Fruit a bur with many and very sharp spines. Annual and mostly similar to A. artemisiifolia, but very rough pubescent, the stem almost acicular-pubescent. Bur usually with a terminal spine and two rings of lateral ones. Second half of summer. Pioneer on wind-eroded sandhills; also adventive at Saskatoon. --swMan-sAlta, US.

23. XANTHIUM L.

CLOTBUR

Fruit a bur formed of fused tegules and covered with numerous acicules hooked at tip. Heads unisexual, the staminate ones few and not obvious. Pistillate ones reduced to 2 flowers, maturing into a bilocular woody bur.

- a. Ferociously armed with axillary spines..... 1. X. spinosum

 aa. Not spiny except the burs 2. X. strumarium

1. X. SPINOSUM L. -- Cocklebur, Bathurst-Bur (Petite bardane) -- Very spiny herb with numerous, yellow, branched, very sharp and very long spines. Leaves lobed, whitish-tomentose below. Bur smaller than in the next. Late summer. Rare weed: Steelman. --O, S, BC, US, SA, Bur.

2. X. strumarium L. (var. canadense (Miller) T. & G., var. glabratum (DC.) Cronq.; X. canadense Miller; X. commune Britton; X. echinatum Murray; X. glanduliferum Greene; X. italicum Moretti) -- Cocklebur (Gratia, Glouteron) -- Fruit a bur about 2 cm long and covered with catchy acicules, the top two acicules stronger. Very scabrous annual. Leaves deltoid-ovate, irregularly serrate. Mid summer. Shores; weedy on occasion. --NS-BC, US, (CA, SA), Bur, (Oc).

This shore plant is at the origin of the name of the Rivière aux Gratiass. The latter is the French toponym of the lower half of the Boyne River, the upper half being the Rivière des Ilets de Bois.

24. HELIOPSIS Persoon

OX-EYE

Resembles Helianthus both habitally and technically, but the receptacle conical, hence the flower center is raised. Also the peripheral florets are fertile (sterile in Helianthus). Rays marcescent, like Zinnia to which it is related.

1. H. helianthoides (L.) Sweet var. scabra (Dunal) Fern. (ssp. occidentalis Fischer) -- Ox-Eye--Monocephalous and showy perennial, resembling Helianthus, but the ligules sulphur (rather than orange) yellow. Very scabrous virgate herb with ovate, opposite, serrate leaves. Peduncle elongate, thickened below the head. Tegules rounded at tip. Mid summer. Open woods and outer edge of gale-rie-forests. --PEI-ecS, (BC), US.

Our taxonomy differs from that of the latest monographic study by T.C. Fischer, in Ohio Journ. Sc. 58: 97-107, 1958, and is justified as follows.

The typical variety is common in the eastern half of the U.S.A., barely entering Canada in southern Ontario. Its leaves are thin, triangular-lanceolate, rounded or cuneate at base, glabrous on both faces, varying to lightly scabrous above and somewhat short pilose below.

The more northern and more widespread phase has thicker and coriaceous leaves, deltoid-ovate, truncate at base, scabrous on both faces, more strongly so above. We are calling it var. scabra because its short and sca-

brous leaves seem to fit Dunal's original description (foliis scabris, ovate oblongo ...) better than the next variety does.

In a yet undescribed variety ranging from Illinois to Texas the leaves are narrower but scabrous. It was called ssp. scabra by Fischer but this interpretation is questionable as pointed out above. This southwestern phase may then properly be known as var. Fischeri var. n. (= ssp. scabra sensu Fischer, nec Dunal), folis scabris, ab ovato-lanceolatis anguste lanceolatis, saepius ter longioribus quem latis. Type: D. Demaree 6648a, near Avoca, Arkansas, May 17, 1929 (DAO).

25. RUDBECKIA L.

CONE-FLOWER

This, the last and the next two genera are easily spotted by the very protuberant center of the head, because of a conical to cylindric receptacle. Disk flowers, but not the ligulate flowers, subtended by bracts. Ray flowers sterile.

- a. Leaves pinnatifid to serrate 1. R. laciniata
 aa. Entire to shallowly serrate 2. R. hirta

1. R. laciniata L. var. laciniata -- Coneflower, Golden Glow -- Very tall herb with large heads, the disk ovoid and the ligules yellow. Often 1-2 m high. Nearly smooth except for the scabrous leaf margins. Leaves large, trifid to pinnatifid with serrate lobes, the upper leaves often not lobed but ovate and merely serrate. Heads few, corymbose on long peduncles. Second half of summer. Galerie-forests, often along the inner (or river) edge. --NS-sMan, US, Bur.

In our plant the leaves are glabrous above and ± strigose below, while the disk scales are only 3-4 mm long. It is seemingly native from southern Manitoba to southwestern Quebec. Its occurrence still further east is probably related to its cultivation as an ornamental. A variant from the central U.S., var. ampla (Nelson) Cronq., has somewhat larger heads, its scales larger, ± 7 mm long, and its leaves glabrous below but usually strigose-muricate above.

2. R. hirta L. (R. serotina Nutt.) -- Brown-eyed Susan, Nigger-Heads (Marguerite jaune, Obéliscaire) -- Showy herb with bicolour heads, the ligules yellow, the semi-hemispheric center purple-black. Stem abundantly punctate in purple-brown, coarsely hirsute and 4-7 dm high, usually virgate and monocephalous. Leaves lanceolate and commonly entire. Tegules nearly as long as the ligules. Mid summer. Open places, mostly on chernozems. --NF, NS-BC, US.

Native with us, but only an introduction in B.C., mainly an introduction in Eastern Canada.

26. ECHINACEA Moench

Like the last but the receptacle bracts spinescent and overtopping the disk florets.

1. E. angustifolia DC. var. angustifolia -- Very showy and very conspicuous; rather similar to the more common Rudbeckia hirta in herbage and habit, but the longer and drooping ligules are pink, fading purple. Disk purple brown. Just before mid summer. Bluffs of coulees and sandy deltas, locally abundant. --swMan-seS, CUS.

Sometimes treated as a variety of the more southern E. pallida Nutt. but the material at hand shown no intermediates.

Our var. angustifolia is usually monocephalous and the stem leaves and peduncle are hirsute to hispid. More southern plants, especially those from Oklahoma, may bear a few heads and be more or less strigose on the leaves and peduncles, these have been named var. strigosa McGregor.

27. RATIBIDA Raf.

Like Rudbeckia, but all florets subtended by bracts. This and the last are perhaps not generically distinct from Rudbeckia.

1. R. columnifera (Nutt.) Woot. & Standl. (Lepachys columnaris (Sims) T. & G.) -- Very showy composite with the center of the head cylindric (!) and subtended by usually 4-(6) large, drooping, yellow ligules. Tufted perennial with pinnatifid alternate leaves. Terminal lobe largest, the lower ones successively smaller. Head with brownish to purple disk. Mid summer. Frequent weed along railroads, roads, etc., also apparently indigenous at least in southern Saskatchewan. --O-seBC, US (CA) -- F. pulcherrima (DC.) Fern. -- Ligules purple. --Man-Alta, US -- F. denudata Boivin -- Ligules lacking. Val-Marie and Bowmantown. --S-Alta.

F. denudata (Boivin) stat. n., R. columnaris Sims f. denudata Boivin, Nat. Can. 87: 46. 1960.

The area of native occurrence is not easy to define. Generally found along roadsides, railway embankments, etc. But in the extreme south of Saskatchewan it seems to recur in some places as a normal element of steppic vegetation. We hold no opinion about Manitoba and Alberta, but in Ontario it is certainly an introduction.

28. BALSAMORHIZA Nutt.

Related to Helianthus, with the peripheral florets fertile and the foliage mostly basal.

1. B. sagittata (Pursh) Nutt. -- Balsam-Root -- Forming rather conspicuous rosettes of large leaves similar to those of Petasites or Arctium. Stem monocephalous and with smaller and narrower leaves. Herbage soft tomentose, the tomentum especially dense near the head. Basal leaves with blades at least 1 dm long and triangular-sagittate; stem leaves few, \pm lanceolate. Head 6-8 cm wide. Late spring and early summer. Foothill prairies. --swAlta-BC, US.

Reports for Saskatchewan by Rydberg and later authors do not appear to be substantiated by any actual collection from the province.

29. HELIANTHUS L.

SUNFLOWER

A basic type with large heads radiate in yellow and pappus reduced to 2 caducous awn-scales. Receptacle chafy. Ligulate flowers sterile.

- a. Annual; leaves alternate.
 - b. Tegules 5 mm wide or more, long caudate ..
..... 1. H. annuus
 - bb. Narrower and barely caudate 2. H. Couplandii
- aa. Perennial; leaves all or mostly opposite.
 - c. Tegules strongly imbricate, broadly acute to rounded at tip 3. H. subrhomboideus
 - cc. Outer tegules narrowly acute to acuminate and mostly about as long as the involucre.
 - d. Leaves ovate, rounded to a petiole 2-5 cm long 6. H. tuberosus
 - dd. Leaf blade oblong-ovate to linear; petiole 1 cm long or less.
 - e. Leaves conduplicate and falcate in the smaller plants; heads racemose in the larger plants
..... 4. H. Maximilianii
 - ee. Leaves flat and the heads corymbose; petioles long ciliate
..... 5. H. Nuttallii

1. H. ANNUUS L. cv. GIGANTEUS -- (var. macrocarpus (DC.) Cockerell) -- Sunflower (Soleil, Tourne-soleil) -- Typically with a single gigantic head nodding towards the sun. Disk 5 cm wide or over. Cultivated and casually reseeding itself, but labile. --NS-PEI, Q-Alta, US, (Bur) -- F. lenticularis (Douglas) Boivin (H. lenticularis Douglas; H. petiolaris Nutt.) -- Wild form of the above. Herbage very rough. Leaves serrate, ovate or deltoid-ovate, 3-10 cm wide. Disk 3-5 cm wide. Tegules 5-8 mm wide, 1.2-2.0 cm long, ovate and abruptly long caudate. Disk purple. Mainly in late summer. Rare

native along eroded coulées; mostly a common weed, especially of roadsides. --PEI-BC, US -- *F. FALLAX* Boivin -- Disk florets orange. Forget. --sS.

A Manitoba report of *f. fallax* by Boivin 1960 is to be discounted as it was based on a variant of cv. *Giganteus* in which the disk florets are orange instead of the usual deep purple.

F. lenticularis seems to be present as a native pioneer species along a few eroded river banks of southwestern Saskatchewan and extreme southern Alberta.

2. *H. Couplandii* Boivin (*H. aridus* AA.; *H. petiolaris* AA.) -- Habitally resembling the last but more delicate and somewhat shiny when alive. Very branchy or with suppressed shoots in all leaf axils. Leaves 0.5-3.0 cm wide, triangular-ovate to triangular-lanceolate, usually entire. Tegules 0.7-1.5 cm long, 3.0-4.5 mm wide, lanceolate, slightly acuminate. Ligules shorter, only 1.5-2.0 cm long. Mid summer. Showy on eroded sandhills; also on disturbed sands. --O-seBC, US.

Sp. n., *H. aridus* auctorum, nec Rydb.; *H. petiolaris* auct. nec Nutt. Annuus scaber, (2)-4-(7) dm alt., ramosissimus vel fasciculiferus in axillis foliorum praecipuis. Folia persaepe integra, ab ovatis lanceolata, ad basas late cuneata vel rotundata, 2-5 cm long., 0.5-3.0 cm lat. Petiolus 1-4 cm. Capita saepe numerosa et paniculata, interdum unicum, centro atropurpureo. Tegulae ab ovato-lanceolatis lanceolatae, (0.7)-1.0-(1.5) cm long., 3.0-4.5 cm lat. Ligulae 1.5-2.2 cm. Type: *B. Boivin 6682*, entre Big Stick Lake et Crane Lake, espèce pionnière sur les dunes éventrées, 28 juillet 1949 (DAO). We have had an opportunity to examine the types of *H. aridus* Rydb. (NY) and of *H. petiolaris* Nutt. (K). Both belong to *H. annuus* f. *lenticularis*.

Dr. R.T. Coupland of the University of Saskatchewan is the author of many important papers on our area, including Ecology of Mixed Prairie, Ecol. Mon. 20: 271-315, 1950.

3. *H. subrhomboideus* Rydb. (*H. laetiflorus* Pers. var. *subrhomboideus* (Rydb.) Fern.) -- Main leaves rhomboid-ovate to rhomboid-lanceolate. Long stoloniferous, hardly tuberous. Heads on very long peduncles and solitary, or the peduncles incurved into a candelabriform inflorescence. Tegules ciliate, glabrous dorsally, the inner acutish, the outer often rounded, and less than half as long as the involucre. Mid summer. Dry, open places, usually on chernozems. --Y, NB-BC, US, Eur.

The related *H. laetiflorus* was reported for Saskatchewan by Fernald 1950, but we found no corresponding specimen at GH in 1965.

4. H. Maximilianii Schrader -- Smaller plants monocephalous, grayish, the leaves conduplicate and strongly falcate. Larger plants with the foliage not quite so characteristic but the inflorescence elongated, somewhat racemose and often secund. Roots tuberous in the manner of the next. Leaves alternate in the upper third, long attenuate at base, the middle, and upper ones sessile, or sometimes the middle ones tapered into a short, ill-defined and winged petiole. Leaf pubescence abundant on both faces, the hairs less than 0.5 mm long and nearly strigose; stem pubescence similar, but sometimes less dense; leaf base not conspicuously ciliate. Involucre 1-2 cm high. Ligules about 2 cm long. Second half of summer. Chernozems, especially around depressions. -- PEI, Q-BC, US.

Native on chernozems between Lake of the Woods and Regina, frequently introduced between Regina and Saskatoon, a sporadic introduction elsewhere; Swift Current, Redcliffe, Calgary, etc.

A dot map in Brittonia 18: 74, 1966 credits this species with a substantially more northern reach (north to Churchill River and James Bay), than the outline given just above. The discrepancy is apparently related to a difference in taxonomic treatment; what we are here calling H. Nuttallii var. subtuberosus being reassigned by Long partly to ssp. canadensis, partly to H. Maximilianii. Hence the similarity in northern limits for the maps on pages 74 and 76 of said paper.

4X. H. Alexidis Boivin -- Hybrid with the next and combining various characteristics of both, such as the inflorescence broad, but the involucre high and the leaves conduplicate. Thornhill and probably elsewhere also. -- sMan.

Hybr. n. Verosimiliter H. Maximilianii X Nuttallii. Variabilis et exhibens notas varias parentium, v.g.: inflorescentia lata, corymbosa atque folia late lanceolata, sed involucre majus, 15-20 mm alt., folia conduplicata, ligulae \pm 2 cm long, etc. Type: J.F. Alex 121, Manitoba, Lisgar District, Thornhill, 1 mile south, native grassland along dry waterway adjacent to highway, Sept. 4, 1957 (DAO).

5. H. Nuttallii T. & G. var. Nuttallii -- Often closely resembling the last, but the leaves flat and the heads corymbose if more than one. Stolons mostly 5-10 cm long, tuberous at tip, producing rootlets which are tuberous towards their attachment. Leaves \pm 1 cm wide, linear to linear-lanceolate, opposite except perhaps the upper 1-3, cuneate at base, petiolate. Petioles successively shorter, the middle ones around 1 cm long, coarsely ciliate, the cilia over 1 mm long. Stem

lightly pubescent to nearly glabrous, the coarse hairs similar to the cilia, but somewhat shorter. Midnerve pubescent like the stem, but the hairs still shorter. Leaves heavily scabrous on both faces with very short hairs inflated at base. Heads monochrome. Tegules 1.5 cm long or less. Ligules 2-5 cm long. Second half of summer. Wettish prairies and along watercourses. --wO-BC, US -- Var. subtuberosus (Britton) Boivin (ssp. canadensis Long; H. fascicularis Greene; H. giganteus AA.; var. subtuberosus Britton; H. subtuberosus Britton) -- Leaves broader, \pm lanceolate, mostly 2-3 cm wide. Commoner. -- (Mack), NF, NS, NB-BC, US -- F. verticillatus Boivin -- Leaves verticillate in 3's or more. Local: Candle Lake. -- S, US -- Var. Rydbergii (Britton) Boivin -- Leaves broad and short, ovate to narrowly oblong., less than 1 dm long. The common phase along creeks in the steppe regions. --sMan-sAlta, US.

Var. subtuberosus (Britton) stat. n., H. giganteus L. var. subtuberosus Britton ex Britt. & Brown, Ill. Fl. 3: 425. 1898.

F. verticillatus nom. n., H. giganteus L. var. subtuberosus Britton f. verticillatus Lakela, nom. ill., Rhodora 49: 21. 1947, nec H. giganteus L. var. verticillatus Farwell 1927.

Var. Rydbergii (Britton) stat. n., H. Rydbergii Britton, Man. Fl. N. Stat. & Can. 993-994, 1901.

The trio H. Nuttallii, subtuberosus and Rydbergii constitute a series of strongly overlapping and completely intergradient phases; their recognition is undoubtedly mechanical. Yet each taxon presents a certain ecological specialization and some degree of geographical individuality; we have felt justified to retain them at the varietal level.

We are not happy yet about the degree and quality of distinctiveness of var. subtuberosus from the eastern H. giganteus L. However we are for the present retaining them as specifically distinct as per the more common current practice. The accepted criteria are as follows. Var. subtuberosus: leaves all opposite, or the upper 1-(3) alternate; tegules ciliate with hairs under 1 mm long and only half as long as the petiolar cilia; leaf pubescence similarly dense and short on both faces, although the hairs are more strongly bulbous-based on the upper face. H. giganteus: the upper (3)-5-(7) leaves alternate; tegular and petiolar cilia similar in size and over 1 mm long; leaf pubescence of dense, short, very stiff and strongly bulbous-based hairs on the upper face, but on the lower face the hairs are not bulbous-based, much less dense, and obviously longer, commonly 0.5-1.0 mm long. Unfortunately these criteria seem far from constant and discrete; it

might be preferable to subordinate H. Nuttallii and its varieties to the earlier H. giganteus.

If the latter solution proves to be preferable, the correct names of our three varieties would be as follows. The common and widespread phase with leaves of middling width returns to H. giganteus var. subtuberosus Britton. The narrow-leaved phase of steppic regions becomes H. giganteus var. utahensis D.C. Eaton. The broad-leaved phase of the steppic regions would require a new transfer.

6. H. tuberosus L. var. subcanescens Gray -- (Esquebois) -- Leaves largest, 5-10 cm wide, ovate, conspicuously 3-nerved, serrate, acuminate, rounded to a winged petiole, opposite. Very stoloniferous, the stolons very long and ending in a purplish potato. Mostly 1-2 m high. Leaves somewhat velvety below, the herbage otherwise scabrous. Heads few in a corymbose inflorescence. Late summer. Galerie-forests. --O-seS, (US).

In the more eastern typical phase the stem leaves are mostly alternate and scabrous on both faces.

Reports of H. divaricatus L. from Saskatchewan have yet to be tied down to specimens actually collected within our area.

30. COREOPSIS L.

TICKSEED

Intermediate to Bidens, the pappus being of two minute teeth. Tegules dimegueth and in two rings; the inner adnate at base and petaloid at tip, the outer much smaller and free. Disk not chaffy.

1. C. tinctoria Nutt. (C. Atkinsoniana Douglas) -- Eye-Flower, Tickseed -- Leaves opposite and pectinatifid to bipectinatifid. Biennial with rather scanty foliage, branchy and the branches opposite. Heads many, bicolour, the disk purple-brown, the ligules golden yellow with a purple brown patch near the base, cuneate with a ragged tip. Mid summer. Exundated places in drier parts of southwestern Saskatchewan and southern Alberta, elsewhere a casual escape from cultivation. --swQ-BC, US.

Appears to be native in southern Alberta and in southwest Saskatchewan, casually adventive or escaped from cultivation elsewhere.

C. Atkinsoniana is merely a form with narrowly winged seeds, sporadic in the range of the species, of no particular significance, not forming a distinct population.

Coreopsis lancolata L. and C. verticillata L. were reported by Macoun 1884 for Western Canada but this may have been a lapsus calami for Canada West. The latter was an alternate name for Upper Canada, now the southern part

of the province of Ontario.

31. THELESPERMA Less.

Obviously similar to the last but the disk chaffy. Pappus also of 2 reduced bristles. Inner involucrel bracts adnate for at least one third of their length.

1. T. marginatum Rydb. -- Heads discoid, its involucre campanulate, of fused bracts, its lobes broadly margined in white. Perennial herb with narrowly dissected leaves and 1 or more heads on very long and subnaked peduncles. (Mid summer?). Eroded hills, rare: Medicine Hat. --seAlta, ncUS.

We know of no Canadian collections other than the ones from The Hat and there is none other at the New York Botanical Garden. The various reports for Saskatchewan must therefore be the result of Medicine Hat being assigned to the wrong province.

32. BIDENS L.

Achenes catchy by 2 or 4 barbellate terminal acicules termed "horns" or "teeth". Tegules in two rings and dimorphic, the inner \pm petaloid.

- a. Submerged aquatic with leaves divided into filiform segments 4. B. Beckii
- aa. Terrestrial and the leaves with a well defined flat limb.
 - b. Head radiate; achene with 4 horns .. 1. B. cernua
 - bb. Eriate; achene with only 2 horns.
 - c. Leaves compound..... 3. B. frondosa
 - cc. Simple, merely serrate to trifid ..
..... 2. B. tripartita

1. B. cernua L. (B. glaucescens Greene) -- Stick-tight, Pitchfork (Fourchettes) -- Heads radiate in yellow; however the ligule-like appendages are not derived from the outer florets, but from the inner petaloid tegules of the involucre. Leaves \pm lanceolate, sessile, serrate. Achenes with 4 horns. Mid to late summer. Common in wet places and shores. -- sMack, Aka, NS-BC, US, Eur.

1X. B. amplissima Greene (B. Stevensonis Boivin, nomen) -- Hybrid with B. frondosa var. puberula. Luxuriant annual with irregularly lobed to trifid or pinna-tifid leaves. Rachis and petiole broadly winged. Heads irregularly radiate. Rare: Brandon. --sMan, swBC.

2. B. TRIPARTITA L. var. TRIPARTITA (B. comosa (Gray) Wieg.; B. connata Muhl.) -- Beggar-Ticks, Stick-tight (Fourchettes, Cornes) -- Leaves typically petio-late and trilobed, but very variable and ranging from

merely serrate to trifid, the upper leaves sometimes merely attenuate to a sessile base. Leaves and outer tegules scarious at margin, the latter sometimes scabrous, the herbage otherwise glabrous. Other characters pretty much as in the next species. Late summer. A rare adventive of wet places: Ronalane. -- NF, NS-O, seAlta-(BC), US, Eur.

Other reports from our area are probably to be discounted. The Manitoba records were discounted by Scoggan 1957. Reports of B. connata Muhl. from the Saskatchewan are based on a Drummond collection from Cumberland House. Its specimen basis has not been investigated yet, but since it has never been confirmed, it is expected to be based on B. frondosa var. puberula.

In our typical variety the achenes are over 2 mm wide, as contrasted with a sinolaurentian var. heterodoxa Fern. in which the disk achenes are only 1-2 mm wide.

3. B. frondosa L. var. frondosa -- Beggar-Ticks, Boot-Jacks (Fourchettes) -- Main leaves compound, mostly trifoliate, the petiole not winged. Glabrous to hirsute. Bracts of the outer series mostly 5-8, green and foliaceous, longer than both the inner series and the disk. Achenes with 2 horns, 2.5-5.0 mm long. Mid to late summer. Shores. -- NF, NS-Man, US, BC, Eur -- Var. puberula Wieg. (B. vulgata Greene, var. puberula (Wieg.) Greene) -- Coarser and the heads with 10-15-(20) tegules in the outer and longer series. Central achenes with horns 4-8 mm long. -- NS, (NB)-Q-BC, US.

A doubtful Alberta report of B. frondosa by Scoggan 1957 could not be substantiated and is herewith discounted.

4. B. Beckii Torrey (Megalodonta Beckii (Torrey) Greene) -- Water-Marigold -- Submerged and usually sterile herb with opposite leaves dissected into filiform segments. Emerged leaves, when present, entire to pinnatifid. Head solitary, radiate. Achene with 3-6 horns longer than the body of the fruit. Late summer. Quiet waters, rare: Wildnest River and Cumberland Lake eastward. -- NS, NB-ecS, sBC, US.

33. GALINSOGA R. & P.

Leaves opposite, the heads radiate, the pappus chafy.

- a. Villous with hairs 0.5-1.0 mm long.... 1. G. ciliata
 aa. Glabrous or finely pubescent, the hairs
 + strigose 2. G. parviflora

1. G. CILIATA (Raf.) Blake -- Quickweed -- A. city weed with small heads briefly radiate in white. Villous annual. Leaves ovate, serrate. Heads about 5 mm high.

All seeds bear a pappus of scales about as long as the body of the seed. Late summer and fall. Neglected lawns and back lanes, rare. --NS-Man, Alta-BC, US, (CA, SA), Eur. (Afr, Oc).

We have checked only two collections from our area, Winnipeg and Calgary, both at DAO. The Boissevain report was based on a sheet of Potentilla norvegica. The Grand Beach and Edwin report have not been checked.

The inclusion of Saskatchewan in its range by Frankton 1970 was apparently based on a specimen cultivated at Saskatoon (DAO), the inference being that the initial seed supply originated somewhere within the province.

2. G. PARVIFLORA Cav. -- Joey Hooker, Yellow Weed -- Sufficiently similar to the first to be generally confused with it. Leaves entire or weakly crenate. Peripheral seeds without pappus. A rare town weed: Hamiota. --Q-Man, US, (CA, SA), Eur.

A rare weed in Canada; we have checked only three Canadian collections: Sherbrooke, Bridgeport and Hamiota, all DAO.

34. MADIA Molina

TARWEED

Most of the tegules half-wrapped around the outer achenes. Pappus none or much reduced.

1. M. glomerata Hooker -- Tarweed -- Heads narrow and few-flowered, about half as wide as high. Heavily glandular-pubescent annual, usually virgate. Heads not very conspicuous, about 1 cm high, few, discoid or briefly radiate in yellow, drying pink, the rays only 1-3, the disk flowers also very few. Second half of summer. Arroyos, sometimes weedy. --(Y-Aka), Q-BC, US.

Appears to be native from Saskatchewan westward, but also occurring as an uncommon adventive. Known in Manitoba from Souris (WIN) and Portage (SASK).

There has been a fair amount of confusion of this species with M. sativa; all specimens named M. sativa from eastern Canada that we have studied turned out to be M. glomerata.

35. HYMENOPAPPUS L'Hér.

Pappus of small hyaline scales. Heads discoid. Tegules in one series, scarious margined, not imbricate. Receptacle not chaffy.

1. H. filifolius Hooker var. polycephalus (Osterhout) B.L. Turner -- Leaves \pm bipectinatifid. Tufted perennial from a taproot, (1)-2-(4) dm high, more or less white tomentose, especially the petioles, the base of the stem and the margin of the tegules. Leaf segments \pm 0.5 mm wide, finely pitted and punctate in deep green. Head

yellow. Early summer. Local on badlands. -- swS-sAlta, ncUS.

A highly variable species. In the latest monograph it is subdivided into a very complex series of 13 intergrading varieties. Only var. polycephalus is recorded as entering Canada. It is a fairly tomentose variant, of medium height, average leafiness and smallish flowers.

36. BAHIA Lag.

Not unlike the last, with a pappus of short hyaline scales. But the leaves opposite and the heads radiate. Not chaffy. Tegules in only one series.

1. B. OPPOSITIFOLIA (Nutt.) DC. (Picradeniopsis oppositifolia (Nutt.) Rydb.) -- A Composite with opposite and narrowly dissected leaves. Deeply stoloniferous perennial, 1-2 dm high. Densely puberulent, finely pitted and glandular-punctate. Heads few, yellow, radiate, but the ligules only 1-3 mm long and paler to nearly white. First half of summer. Eroded and saline clays along arroyos and ditches, rare. --swS-swAlta, US.

We have seen specimens from Nashlyn (DAO), Divide (DAO), Pambrun (CAN, DAO) and Coaldale (CAN, DAO). It has also been reported from Lethbridge.

37. HYMENOXIS Cass.

RUBBER-WEED

Like the last two with a pappus of short hyaline scales. Leaves alternate or basal. Heads radiate. Tegules more numerous, two layers thick, but isomegueth.

a. Leaves entire, all basal..... 1. H. acaulis
aa. Stem with deeply dissected leaves

..... 2. H. Richardsonii

1. H. acaulis (Pursh) Parker var. acaulis (Tetra-neuris simplex Nelson) -- Leaves densely soft sericeous on both sides, entire, oblanceolate, all basal. Forming a small dense cushion from a taproot. Scape about 1 dm high, monocephalous. Head yellow, radiate, the ligules fading white. Leaves finely glandular-punctate as in the last two genera. Early summer. Upper part of eroded hills; Mortlach and Cypress Hills westward. --swS-sAlta, US.

In the magnilacustrine var. glabra (Gray) Parker, the leaves are green, lightly villous or glabrescent, the heads often somewhat larger.

2. H. Richardsonii (Hooker) Cock. var. Richardsonii -- Leaves pectinately divided into 3-5 remote and filiform segments. Herbage green. In small tufts, about 1 dm high. Also glandular-punctate. Ligules yellow, fading white. Early summer. Wind eroded hills and bad-

lands. --sS-sAlta, US.

In a more southern var. floribunda (Gray) Parker the somewhat smaller heads are more numerous and the whole plant tends to be larger.

Macoun 1884 mentions a collection of Chaenactis Douglasii (Hooker) H. & A. by Dawson at Wood Mountain, but we have found nothing at CAN or MTMG under that name or under the neighbouring genera. Unless this be a lapsus calami for Actinella Richardsonii (Hooker) Nutt. (=Hymenoxys), the latter being represented at CAN by an old Wood Mountain collection which Macoun does not mention under the last two names.

38. HELENIUM L.

SNEEZEWEED

A basic type, similar to Helianthus, the heads radiate in yellow, but pappus present, of two or more series of hyaline scales. Receptacle not chaffy.

1. H. autumnale L. var. montanum (Nutt.) Fern. -- Sneezeweed -- Leaf blade decurrent down to the next node, the stem thus narrowly winged. Leaves lanceolate, usually entire, finely glandular-punctate in yellowish to pale brown. Heads yellow, more than hemispheric, with paler and drooping ligules. The latter (0.8)-1.0-(1.5) cm long, obtriangular, 3-lobed at apex. Mid to late summer. Wet-tish meadows and edge of woods. --wO-BC, (US) -- Var. grandiflorum (Nutt.) T. & G. (H. macranthum Rydb.) -- Heads larger, the ligules 1.5-2.5 cm long. --sMack, swAlta-sBC.

The collections from Saskatchewan distributed by Breitung as H. macranthum and reported by him as H. autumnale have been revised to var. montanum.

39. GAILLARDIA Foug.

Receptacle chaffy. Otherwise similar to Helenium. Ligules also conspicuously 3-lobed at apex. Receptacle convex to subglobose.

1. G. aristata Pursh -- Very showy bicolour head with a purple center and orange-yellow ligules purple at base. Short-lived perennial, hirsute, commonly monocephalous. Leaves entire to pinnatifid. Peduncle elongate. Head 4-8 cm across, the disk hemispheric. Tegules elongate and very unequal. Early summer. Occasional in prairies. -- sMack, swQ-BC, US-- F. monochroma Boivin -- Ligules and disk florets of a single colour, yellow throughout. Local: Waldheim, Milk River, Porcupine Hills. -- S-BC.

Specimens with smaller heads are found throughout, but the range of size variation increases gradually westward and the largest heads are found in the Rockies. This

was noted by Macoun long ago, but it seems difficult to define this situation in taxonomic terms, although it is not much unlike the situation in Helenium.

40. ANTHEMIS L.

CHAMOMILE

This and the next 5 genera similar to Helianthus, Helenium, etc., but the tegules scarious or hyaline along the margin. Receptacle conical, chaffy. Pappus none or vestigial.

- a. Heads radiate in white 1. A. Cotula
- aa. In yellow 2. A. tinctoria

1. A. COTULA L. -- Mayweed, Dogfennel (Petite Marguerite, Maroute) -- Peduncle pubescent. Tegules acutish at tip. Receptacle chaffy in the central half. Otherwise very similar to, and not readily distinguished from, the more common Matricaria Chamomilla. Summer. Rare railway weed: Morris, Killarney, Wetaskiwin, Troy. -- (Y-Aka, NF), NS-(PEI)-NB-Man-(S)-Alta-BC, (US, Eur.).

We have checked specimens from Morris (DAO) and Wetaskiwin (SASK) while Dr. C. Frankton has also checked specimens from Killarney (CAN) and Troy (CAN). Otherwise all reports from our area are held as questionable because of the frequent confusion with Matricaria. Manitoba and Saskatchewan reports by Groh 1948 were based on specimens of Matricaria Chamomilla, and for Alberta on M. maritima.

2. A. TINCTORIA L. (Cota tinctoria (L.) Gay) -- Yellow Chamomile (Oeil de boeuf, Camomille jaune) -- Heads ligulate and resembling a Daisy, but bright yellow. Leaves pinnatipartite, the segments dimegueth, the larger ones pinnatifid, more or less alternating with much smaller and entire segments. Summer. Infrequent escape, mainly along roadsides. -- Aka, NF, NS, NB-BC, US, Eur.

41. ACHILLEA L.

YARROW

Like the last, but the receptacle flattish and the heads quite small.

- a. Leaves serrate 1. A. Ptarmica
- aa. Much more deeply dissected.
 - b. Leaves pinnatifid, the lobes dentate ...
 - 2. A. sibirica
 - bb. Much more deeply and finely dissected ..
 - 3. A. Millefolium

1. A. PTARMICA L. f. MULTIPLEX (Reynier) Heimerl -- Sneezeweed, White Tansy (Herbe à éternuer) -- Double-flowered heads small and white in a corymb. Stoloniferous. More or less virgate, 3-10 dm high. Leaves li-

near-lanceolate. Summer. Cultivated and sometimes spreading to roadsides and waste areas. -- Aka, NS, Q-Man, Alta-BC.

2. A. sibirica Led. (A. multiflora Hooker) -- With small heads and obviously resembling the more common A. Millefolium, but taller and the leaves less divided. Virgate and tufted, 10-15 dm high. Leaves elongate, pinnatifid, the lobes oblong and serrate. Mid summer. Moist spots in forested regions, not frequent. -- Mack-Aka, Q-nBC, cnUS, (Eur).

3. A. MILLEFOLIUM L. f. PURPUREA (Gouan) Schinz & Thellung -- Yarrow, Fern-Tansy (Herbe à dindes) -- Ligules velvet-purplish above, pink below. Stamens lacking, hence sterile and spreading only be rhizomes. Otherwise similar to the common var. occidentalis, but somewhat taller and less densely pubescent. Late summer. Sometimes cultivated and rarely escaping to railway embankments, etc. -- Aka, NS-Man, US, (Eur) -- Var. occidentalis DC. (var. lanulosa (Nutt.) Piper; A. lanulosa Nutt.) -- An almost ubiquitous herb with very finely dissected leaves and a corymb of small, white heads. Long stoloniferous. Leaves bipinnatipartite to tripinnatipartite into numerous small segments less than 1 mm wide. Involucre usually 4-5 mm high. Tegules pale brown to hyaline at margin. Ligules 1-4 mm long, white. Summer. Very common in open places, mainly steppes and prairies, sometimes weedy. -- Mack, Aka, L-SPM, NS-(PEI)-NB-BC, US, (CA) -- F. rosea Rand & Redfield (f. roseoides Breitung) -- Ligules pink above, nearly white below. Local -- (NF-(SPM), NB-BC, (US) -- Var. megacephala (Raupe) Boivin (A. megacephala Raup) -- Heads larger, the involucre mostly 6-7 mm high. Mostly sand dunes. -- sMack, nwS-Alta -- Var. nigrescens E. Meyer (var. alpicola (Rydb.) Garrett, var. borealis (Bongard) Farw.; A. borealis Bongard) -- Tegules with a darker margin, brown to blackish. The more common or even exclusive phase northward. -- G, K-Aka, L-SPM, NS-BC, US, Eur -- F. roseiflora Boivin -- Tegules darker as in var. nigrescens and the ligules pink as in f. rosea. -- K-Aka, L-NF, Q-O, S-BC.

The first described is an uncommonly escaped ornamental. All specimens examined lacked anthers. That they are of European origin seems hardly questionable. The rest of the north American material is apparently native.

If we except the highly local and larger-headed var. megacephala, our specimens are fairly readily referable to the two varieties above. We have not however been able to detect a clear morphological gap between our American types and the legion of minor Eurasian variants. We have been equally unable to relate our plants clearly to the

many eurasian variants. Hence we could not be sure that the varietal epithets used are actually the earliest available.

The european plants are hexaploid and seem closest cytologically to var. nigrescens. But by their morphology it is var. occidentalis and var. Millefolium that are nearest to one another and hence often confused. This is also part of the uncertain nomenclatural situation.

Of our two main types, var. occidentalis is commonly tetraploid while var. nigrescens is hexaploid ($2n=54$). The level of morphological differentiation is low and its quality is poor. However it is possible to state that, grosso modo, the tetraploid var. occidentalis is the common and wide-spread type in North America, while in the mountains, on the Pacific slope and in subarctic habitats it generally gives way to the hexaploid var. nigrescens.

Our two varieties are further recognizable with the help of a good microscope as there is a slight average difference in the outer diameter of the pollen grains, a difference apparently related to the chromosome numbers. The following figures were obtained by Mulligan and Bassett in 1950:

var. occidentalis: $2n=36$; diam (26)-27-30-(31) μ .

var. nigrescens: $2n=54$; diam (31)-32-33-(34) μ .

Specimens of var. occidentalis from the interior of the continent are usually readily distinguished from var. Millefolium, but eastward the morphological distinction becomes gradually less convincing. Further, some of the eastern specimens with the apparent morphology of var. occidentalis have the pollen size of var. borealis. The opinion has been expressed that these could represent a european introduction, but the evidence in favor of the latter is rather negative and we are more inclined to treat this material as an intergrading series between our two main phenotypes. A similar situation prevails in the western U.S.A. where one meets with an hexaploid, var. californica (Pollard) Jepson, which approaches var. occidentalis in its morphology. In short, the correlation morphology-cytology is incomplete.

The tetraploid seems absent from Europe; obviously var. occidentalis should be regarded as native. Since var. nigrescens is primarily a plant of native habitats, it too is expected to be a native variant, even if also found in northern Scandinavia.

Our 1951 classification was rather elaborate and has not proved to be a good and practical scheme.

42. MATRICARIA L.

WILD CHAMOMILE

Quite similar to Anthemis, yet the conical receptacle not chaffy.

a. Heads discoid..... 3. M. *matricarioides*
 aa. Ligulate.

b. Receptacle hemispheric, somewhat broader
 than high, sometimes becoming conical in fruit;
 herb odorless 1. M. *maritima*

bb. Receptacle conical and much higher than
 wide; herb pineapple-scented ... 2. M. *Chamomilla*

1. M. MARITIMA L. var. MARITIMA (var. *agrestis*
 (Knaf) Weiss; M. *inodora* L.; *Chamomilla inodora* (L.) Gi-
 lib.) -- Bachelor's Button, Barnyard-Daisy -- Much like
 the next species and not readily distinguished from it.
 Odorless. Corolla lobes yellow with a brown spot towards
 the tip. Achene with 3 very strong ribs and 2 large
 brown glands near the top on the outer face. Annual or
 biennial, 3-10 dm high. Tegules light-coloured along
 the margin, hyaline to pale brown. Mid to late summer.
 Casual weed, mostly of roadsides and railways. -- G, Mack,
 Aka, L-SPM, NS-BC, US, Eur -- Var. *nana* (Hooker) Boivin
 (M. *ambigua* (Led.) Krylov) -- Tegules dark-margined in
 brown to blackish. Often perennial and usually shorter,
 1-4 dm high. Sandy arctic coasts. -- G-Aka, L, nQ-nO-
 nMan, (nEur).

Var. *nana* (Hooker) stat. n., *Pyrethrum inodorum*
 (L.) Sm. var. *nanum* Hooker, Fl. Bor. Am. 1: 320. 1834.

2. M. CHAMOMILLA L. (*Chamomilla Chamomilla* (L.)
 Rydb.) -- Wild Chamomile (*Chamomille*) -- Large-Headed
 and suggesting a Daisy by its bicolour heads, but the
 leaves bi- to tripectinatifid into numerous segments
 less than 1 mm wide. Ligules white, marcescent and even-
 tually drooping. Disk yellow, hemispheric, tending to
 conical in fruit. Achene without glands. Closely resem-
 bling both M. *maritima* and *Anthemis Cotula*. From M. *ma-*
ritima it differs by being pineapple-scented when freshly
 crushed; corolla lobes pure yellow; achene rugose with
 5-7 nerves; pappus reduced to a short crown-like ridge.
 From *Anthemis Cotula* it differs by its herbage glabrous or
 nearly so; tegules rounded at tip; receptacle not chaffy.
 Early summer. Infrequent weed of farmyards and roadsides.
 -- G, NF, NS, NB-(Q)-O-BC, US, Eur, (Oc).

3. M. MATRICARIOIDES (Less.) Porter (*M. *suaveolens**
 (Pursh) Buch.; *Chamomilla suaveolens* (Pursh) Rydb.) --
Pineapple-Weed, Wild Marigold (Herbe à crapaud) -- Dis-
 coid and strongly pineapple-scented when freshly crushed.
 Annual, up to 5 dm high. Leaves finely dissected like
 the last two. Tegules broader, ± oblong and more stron-
 gly cucullate at tip. Early summer to frost. Disturbed
 or bare soils, a common weed, very tolerant of tramping.
 --(G)-seF, Mack-Aka, L-SPM, NS-BC, US, (CA), Eur.

Reputedly native in the western U.S.A., it has al-
 ways seemed to us introduced wherever we met with it in

Canada. In 1884 Macoun knew it only from the Pacific coast and from the upper Kootenay. This gives an idea of its path of entry or, conversely, of its original area as a native plant, assuming that it ever was native in Canada.

The range is extended to Franklin District on the basis of the following collection: A. Dutilly, Terre de Baffin, Cap Dorset, 25 août 1936 (QFA).

43. CHRYSANTHEMUM L.

OXEYE-DAISY

Like Anthemis and Matricaria, but the receptable flattish and not chaffy. Head typically ligulate.

a. Heads discoid 3. C. Balsamita
aa. Ligulate.

b. Leaves long cuneate, grading into the
petiole 2. C. arcticum

bb. Leaves dimorphic, the lower and basal
petiolate, the middle sessile and not
narrowed at base 1. C. Leucanthemum

1. C. LEUCANTHEMUM L. var. LEUCANTHEMUM (var. pinnatifidum Lec. & Lam.; Leucanthemum vulgare Lam.) -- Daisy, Bull's Eye (Marguerite, Marguerite blanche) -- The typical Daisy, a loosely tufted herb with virgate monocephalous stems, the head with a yellow centre and long white ligules. Stems 3-8 dm high. Leaves lyrate-pinnatifid, more deeply so towards the base. Head 3-5 cm across. Mainly the first half of summer and then sporadically till fall. Formerly cultivated and now frequently spreading to wetter spots in pastures and along roadsides. --(NS-NB)-Q-(O)-Man-Alta-(BC, US, Eur) -- Var. BOECHERI Boivin (C. ircutianum Turcz.) -- Not so deeply dissected, the stem leaves merely serrate or may be some of them subpinnatifid towards the base. Similar habitats, but tetraploid. --K, Y, L-(NF)-SPM, NS-PEI-(NB)-Q-Alta-(BC), US, SA, Eur.

Var. Boecheri nom. n., C. ircutianum Turcz., Bull. Soc. Nat. Moscou 29: 177. 1846. See also T.W. Böcher & K. Larsen, Cytotaxonomical Studies in the Chrysanthemum Leucanthemum Complex, Watsonia 4: 11-16. 1957.

2. C. arcticum L. var. polaris (Hultén) Boivin -- (Chrysanthème du Kamtchatka). Heads much as in the last, but the foliage fleshy. Stem 1-2-(3) dm high, subscapose or the foliage nearly all basal. Leaves long cuneate into a winged petiole, the blade coarsely toothed to lobed, and obovate to cuneate in shape. Tegules conspicuously blackish-bordered. Early to mid summer. Arctic coasts. --K-Mack-(Y-Aka), nQ-nMan, nEur.

Stat. n., ssp. polaris Hultén, Svensk Bot. Tidskr. 43: 776. 1949. The typical phase occurs west of us, in the Queen Charlotte Islands westward to eastern Asia; it

is commonly a taller plant with the leaves more deeply cut, mostly trifold to pinnatifid.

3. *C. BALSAMITA* L. f. *TANACETOIDES* (Boiss.) Boivin -- Costmary, Mint Geranium (Herbe au coq, Grand Baume) -- Numerous discoid and yellow heads in a terminal corymb. Leaves thickish, serrate, elliptic to lanceolate, the lower long petiolate and much larger, the upper somewhat glaucous. Fall. Rarely spreading from cultivation: Lloydminster. --swQ-O, S, US, (Eur).

Stat.n., *Pyrethrum Balsamita* (L.) W. var. *tanacetoides* Boiss., Fl. Or. 3: 346. 1875. The heads are rayed in the typical form, the latter apparently not known as an escape in Canada.

44. TANACETUM L.

TANSY

Ligules very short or lacking; otherwise hardly different from *Chrysanthemum*.

- a. Leaf segments 3-10 mm wide 1. *T. vulgare*
aa. Much more finely divided, the segments about
1 mm wide 2. *T. huronense*

1. *T. VULGARE* L. -- Tansy, English Fern (Tanaïs, Tenzé) -- Numerous yellowish-green discoid heads in a terminal corymb. Leaves pinnatifid, the primary segments pinnatifid, the ultimate lobes entire to serrate. Heads mostly less than 1 cm across, from slightly depressed to somewhat convex at center. Mid summer. Often cultivated and readily spreading to roadsides. -- Mack, (Aka), sL-SPM, NS-BC, US, Eur -- Cv. CRISPUM -- More deeply dissected, ± bipinnatifid, the lobes overlapping, crisp and upwardly curled at the tips. Less common. -- (NS)-PEI-O, (S)-Alta-(BC).

2. *T. huronense* Nutt. (var. *bifarium* Fern., var. *floccosum* Raup, var. *monocephalum* Boivin, var. *terraenovae* Fern.; *T. bipinnatum* AA., ssp. *huronense* (Nutt.) Breitung) -- Leaves feathery, very finely dissected, tripectinatifid, the ultimate segments about 1 mm wide. Lightly to heavily tomentose stoloniferous perennial. Heads few, mostly 2-5, and usually 1-2 cm across, nearly discoid, the yellow ligules only 1-2 mm long. Mid summer. Sandy shores, infrequent. -- K-Y-(Aka), NF, NB-BC, US.

Highly variable and many phenotypes have received names. We have been unable to bring them into a satisfactory classification, although the total range is conveniently broken up in a series of discrete areas. In each area a particular type tends to dominate, such as a single large head around Hudson Bay (var. *monocephalum*), or more heavily lanate around Lake Athabaska (var. *floccosum*), or the leaves somewhat fleshy along the Pacific

Coast (T. Douglasii DC.), etc., yet each local population is highly variable, so variable indeed that its morphological originality can be accurately expressed only in terms of higher frequency of a particular phenotype in a particular area.

45. ARTEMISIA L.

WORMWOOD

Heads small and resembling Achillea. However the heads are discoid and the receptacle is not chaffy.

- a. Leaves entire to coarsely lobed Group A
 aa. Pinnatipartite to tripinnatipartite Group B

Group A

Main stem leaves varying from entire to coarsely and deeply lobed.

- a. Shrubby; leaves grayish to whitish tomentose on both faces.
 b. Leaves oblanceolate to linear, entire ...
 13. A. cana
 bb. Cuneate, the apex truncate and three-toothed 12. A. tridentata
 aa. Herbaceous.
 c. Main leaves entire, green and usually glabrous 2. A. Dracunculus
 cc. White-arachnoid below, commonly serrate to lobed.
 d. Leaves heavily grayish or whitish-arachnoid on both faces ... 11. A. ludoviciana
 dd. Less pubescent and much darker above.
 e. Leaves entire and strongly revolute 9. A. longifolia
 ee. Flat and at least the lower ones coarsely lobed 8. A. Tilesii

Group B

Leaves deeply and narrowly dissected; pinnatipartite to tripinnatipartite.

- a. Leaf segments narrow, all or mostly less than 1 mm wide, usually entire.
 b. Sterile; many ultimate segments with 1-(2) teeth 5. A. pontica
 bb. Heads normally present in season; ultimate segments entire.
 c. Whitish tomentose throughout, including the involucre 15. A. frigida
 cc. At least the involucre greenish.
 d. Branchy shrub, woody below ...
 4. A. Abrotanum

- dd. Herb, the stem not branched....
 1. A. campestris
 aa. Segments broader and mostly toothed or lobed.
 e. Leaves discolour, grayish to white-to-
 mentose below, less densely so to gla-
 brous above.
 f. Leaves petiolate, without stipu-
 les 14. A. Absinthium
 ff. Leaves sessile, the lower pair of
 segments often stipule-like.
 g. Herb 2-4-(5) dm high; leaf seg-
 ments 1-3 mm wide 10. A. Michauxiana
 gg. Much taller plant with broader
 leaf segments 7. A. vulgaris
 ee. Leaves green and similar on both faces.
 h. Heads 5-10 mm across 6. A. norvegica
 hh. Much smaller and very numerous
 3. A. biennis

1. A. campestris L. var. Wormskjoldii (Besser) Cronq. (var. spithamea (Pursh) Peck; A. borealis Pallas) -- (Aurone sauvage, Armoise rouge) -- Virgate paren-
 nial with finely dissected leaves and a narrow panicle
 of few heads. Tufted, with heavy rosettes, the foliage
 primarily basal. Leaves pinnatifid to bipinnatifid,
 green or grayish and more or less pubescent. Stems
 1-3-(4) dm high. Stem leaves few. Inflorescence of uni-
 form width, its lower branches long overtopped by the sub-
 tending leaves. Corollas usually purplish in the upper
 part. Mid summer. Alpine slopes and subarctic shores.
 --(G)-F-Aka, L-NF, Q-nO, nwS-(Alta)-BC, nwUS, (Bur) --
 Var. Scouleriana (Besser) Cronq. (var. caudata (Mx.)
 Palm. & Stey.; A. canadensis Mx.; A. caudata Mx.) -- Tal-
 ler, mostly 3-8 dm high, the stem more leafy, the inflo-
 rescence a narrow panicle with the lower branches mostly
 overtopping the leaves. More often biennial. Herbage
 mainly cauline, green and more or less pubescent. Corol-
 las yellow, the lobes often purple-margined. Mid summer.
 Mostly sandy shores and open, sandy woods. --seK-Y-(Aka,
 L)-NF, NS, NB-BC, US -- Var. Douglasiana (Besser) Boivin
 (A. Bourgeauiana Rydb.; A. camporum Rydb.; A. caudata Mx.
 var. calvens Lunell; A. Forwoodii Watson) -- Like the last
 variety, but more pubescent, the herbage grayish-tomento-
 se. Steppes and prairies, common. --Mack-Y, Q-BC, (US).
 Var. Douglasiana (Besser) stat. n., A. desertorum
 Sprengel var. Douglasiana Besser ex Hooker, Fl. Bor. Am.
 1: 325. 1833.

A rather variable type, both in the Old World and
 in the New. Our three varieties are somewhat arbitrary.

By increasing the level of arbitrariness one could recognize still more segregates as we did in 1955 (two species, seven varieties). To-day we regard this earlier classification as too arbitrary, too elaborate, and hardly worth retaining.

2. A. Dracunculus L. (A. dracunculoides Pursh; A. glauca Pallas) -- Tarragon (Estragon, Herbe au dragon) -- With numerous small heads and numerous linear-ligulate, entire leaves. Stem mostly 5-10 dm high. Leaves 1.5-10.0 cm long, 1.5-4.0 mm wide, the lower ones often trifid. Mid to late summer. Steppes and hillsides. -- (Y)-Aka, wO-BC, US, (CA), Eur.

3. A. biennis W. -- (Herbe Saint-Jean) -- Biennial. Glabrous and branchy. Upper leaves linear and entire, the middle and lower pinnatipartite to bipinnatipartite, the segments mostly 2-3 mm wide, sharply and irregularly serrate to lobed. Inflorescence a panicle of numerous spiciform groups of small heads. Late summer and fall. Common on shores where apparently native; a frequent weed of disturbed soils. -- Mack, NS-BC, US, (eEur, Oc).

4. A. ABROTANUM L. -- Southernwood, Sweet Benjamin (Aurone, Citronelle) -- Perennial, woody below, and the leaf segments mostly 0.2-0.3 mm wide. Herbage puberulent, very densely so on growing parts. Otherwise much resembling A. biennis. Second half of summer and early fall. Cultivated and spreading to roadsides and waste places. --Q-Alta, (US, Eur).

5. A. PONTICA L. -- Roman Wormwood (Petite Absinthe, Plante de beauté) -- Normally sterile with us. A simple, virgate, gray-blue perennial herb growing in dense colonies. Herbage densely puberulent, the leaves whitish below. Leaves bipinnatipartite, the segments 0.5-1.0 mm wide. Panicles are rarely produced in late summer. Sometimes cultivated, long persistent and spreading vegetatively to waste places: Dauphin. -- NS, Q-Man, US, Eur.

6. A. norvegica Fries var. saxatilis (Besser) Jepson -- Heads few, largest and commonly racemose. Tufted perennial 2-5 dm high. Leaves mostly basal, bipinnatipartite, the ultimate segments entire or nearly so. Tegules broadly margined in purple black. Heads 5-10 mm wide, drooping on erect peduncles. Mid summer. Alpine slopes. --(wF), Mack-Aka, (neO), swAlta-BC, wUS, (eEur).

The typical phase of western Eurasia is a usually smaller plant, its heads tend to be larger, and the central rachis of the leaf is shorter so the limb seems almost palmately cut.

7. A. VULGARIS L. -- Mugwort (Herbe Saint-Jean, Herbe à cent goûts) -- Leaf seemingly stipulate, the lower 1-2 pairs of lobes or leaflets being borne at the base

of the petiole-like rachis. Branchy perennial. Leaves dark green and glabrous or nearly so above, white-tomentose below, pinnatifid or pinnatipartite to compound towards the base. Tegules with a deep green midnerve and white-tomentose limb. Mid summer to frost. Rare weed of waste places. --(G), NF, NS-S, BC, US, (CA), Eur.

8. A. Tilesii Led. (var. unalaschkensis Besser; A. Herriottii Rydb.) -- Very variable type, but with the stem leaves, or at least the lower ones, long-lanceolate with a few lanceolate lobes. About 1 m high. Leaves 0.5-1.5 dm long, 5-20 mm wide, white-arachnoid below, grayish tomentose above when young, becoming glabrous. Heads few to many, small to large. Sometimes resembling the last species, but lacking the stipule-like lobes. Sometimes close to the next, but the leaves thinner and often larger and at least the lower ones lobed. Mid summer. Open woods and river flats. --(wF)-K-Aka, wQ-BC, (US), nEur.

A rather polymorphic type, perhaps divisible in two or three geographical variants. We have not yet been able to establish or recognize a sound morphological basis for the distinction of such variants.

9. A. longifolia Nutt. -- Linear leaves strongly revolute and white-arachnoid below. Densely tufted from a woody base and taproot. Leaves (2)-3-5-(8) mm wide, thickish, lightly arachnoid above, entire. Stem simple, 3-8 dm high. Involucre arachnoid. Mid summer. Wind eroded steppes and badlands or lightly alkaline soils. -- sMan-sBC, US.

Has been recently detected west of us at Osoyoos (DAO), Kelowna (DAO) and Summerland (UBC). The Ontario report by Fernald 1950, repeated by Scoggan 1957, queried by Boivin 1967, is to be discounted as it could not be substantiated at GH or elsewhere.

10. A. Michauxiana Besser -- Segments of the lower pair stipule-like as in A. vulgaris, but the stem shorter and simple and the leaf segments narrower. With a taproot and somewhat stoloniferous, forming loose colonies. Leaves green above, white-arachnoid below, pectinatipartite to bipectinatipartite, the segments 1-3 mm wide. Inflorescence very narrow, sometimes subspiciform. Early summer. Gravels and rocky exposures at mid altitude. -- swAlta-BC, wUS.

11. A. ludoviciana Nutt. var. ludoviciana (var. gnaphalodes AA., var. latifolia (Besser) T. & G.; A. diversifolia Rydb.; A. gnaphalodes AA.; A. Purshiana Besser) -- Sage, White Sage -- Long stoloniferous. Leaves mostly 1 cm wide, lanceolate, grayish to white-tomentose on both faces, entire to paucidentate towards the apex. Heads arachnoid with a purplish or brownish disk. Late summer.

Prairies and open places, common. --sMack, PEI-BC, US--
 Var. gnaphalodes (Nutt.) T. & G. (A. pabularis (Nelson)
 Rydb.) -- Smaller and often yellowish-pubescent. Leaves
 ± linear, 3-5 mm wide, most often conduplicate. Steppes.
 --swQ-Alta, US.

With us this is essentially a native plant, but its
 occurrence in Eastern Canada is mainly in the form of a
 not particularly aggressive weed invading open places.

The type of Artemisia gnaphalodes Nutt. (PH) is the
 narrow-leaved phase commonly treated as A. pabularis (Nel-
 son) Rydb., while the type of A. ludoviciana (also PH)
 is merely a sterile shoot of the broader leaved phase col-
 lected late in season and somewhat glabrescent above as
 often happens in what is usually called A. gnaphalodes.
 Hence the shift in names and the usage adopted here, in
 which var. gnaphalodes becomes the correct name for the
 narrow-leaved phase.

12. A. tridentata Nutt. var. tridentata -- Sage-
 brush (Absinthe) -- Leaves narrowly cuneate, three-too-
 thed at apex. Shrubby. Herbage grayish-tomentose throug-
 hout. Heads numerous and small. Late summer and fall.
 Steppes along the South Castle Creek in the Crowsnest
 Area. swAlta-sBC, US, (CA).

Involucre 3-4 mm high. At Hedley B.C. (DAO) and
 south there occurs a var. Vaseyana (Rydb.) stat. n., A.
Vaseyana Rydb., N. Am. Fl. 34: 283. 1916, with somewhat
 larger heads, the involucre ± 5 mm high.

13. A. cana Pursh -- Wild Sage -- Shrubby with nar-
 row and entire leaves equally whitish-tomentose on both
 faces. Panicle leafy, the leaves mostly overtopping the
 flowering branches. Late summer and early fall. Dry hills
 and steppes. --swMan-sAlta, US.

14. A. ABSINTHIUM L. var. INSIPIDA Stechmann --
Wormwood, Absinth (Absinthe) -- Leaves grayish-
 tomentose and pinnatifid to nearly tripinnatifid into li-
 gulate and subentire segments about 2-4 mm wide. Panicle
 ample with numerous drooping hemispheric heads about 4 mm
 wide. Mid summer to fall. Cultivated and casually spread-
 ing to roadsides, etc. -- (NF-SPM), NS-(PEI)-NB-BC, US,
 Eur.

15. A. frigida W. -- French Sage, Prairie-Sage-
wort -- Foliage whitish and finely divided, the leaves
 rather short. Tufted perennial, white-silky throughout.
 Leaves less than 2 cm long, pinnatipartite to bipinnati-
 partite, the segments entire and less than 1 mm wide.
 Second half of summer. Vary common in steppes and prai-
 ries. --Mack-Aks, NB-BC, US, Eur.

Essentially a prairie species, it is known in Eas-
 tern Canada as a sporadic introduction, but is perhaps
 also native at a few spots on Lake Superior.

46. PETASITES Miller SWEET COLTSFOOT
 Resembles Senecio. Flowering stems shedding their

seeds and evanescent by the time the basal leaves are fully grown. Plants subdioecious. Stem leaves very much reduced.

Species of this genus present some unusual and inherent difficulties of identification, partly because of the alternance of biological phases. Most specimens will represent only one phase and the correlation of characters is difficult to establish. Then herbarium specimens showing both phases are a small minority and in most cases the two phases are not root-connected, leaving open the possibility that they may have come from different clones, perhaps different species.

Many specimens have turned up identified or revised to various hybrid combinations. We have studied a fair number of such specimens at DAO, UBC and V, and we are not fully satisfied that their morphology could justify the postulate of hybridity. Most such specimens have been revised or returned to P. vitifolius, others to P. sagittatus or P. palmatus. However we have not yet seen the many Yukon and Alaska intermediates discussed by Hultén 1950.

a. Leaves suborbicular, palmatifid 3. P. palmatus
aa. Deltoid to sagittate, undulate to lobed.

b. Deltoid and deeply lobed 2. P. vitifolius

bb. Sagittate, the margin undulate to coarsely dentate 1. P. sagittatus

1. P. sagittatus (Banks) Gray -- Like the next two, but the leaves triangular-sagittate, 1-2 dm long, deeply cordate at base, the margin sinuate to dentate. Stems arachnoid-pubescent, not glandular. Pappus 15-22 mm long. First half of spring. Wet places. -- (seF)-K-Aka, L, Q-BC, US.

The more northern P. frigidus (L.). Fries was mapped by Porsild 1957, 1964, showing an unlikely dot near Jasper, but was not listed by Porsild 1959. The specimen basis of the dot could not be determined positively.

2. P. vitifolius Greene (P. frigidus (L.) Fries var. nivalis (Greene) Cronq.) -- Like the next. Leaves deltoid, deeply cordate, irregularly lobed and dentate, about as wide as long, sometimes up to 2 dm across, but mostly under 1 dm wide. Stem both arachnoid and glandular. Pappus 12-15 mm long. Spring. Wet or boggy places. --(sK)-Mack-Aka, (L), Q-BC, US.

3. P. palmatus (Aiton) Gray var. palmatus (P. frigidus (L.) Fries var. palmatus (Aiton) Cronq.) -- Herb at first producing a simple flowering stem with leaves reduced to large dilated stipules and a dense raceme elongating in fruit. Leaves appearing later in early summer only. Stoloniferous. Stem 2-6 dm high, glandular-pubes-

cent, rarely slightly arachnoid. Leaves up to 2 dm across, suborbicular, palmatifid. Heads short ligulate; involucre up to 1 cm high, ligules yellowish, pappus 8-12 mm long. Spring. Frequent in low places. --(sK)-Mack-Y, L-NF, NS-neBC, neUS.

A report of the related genus Erechtites hieracifolia (L.) Raf. by Macoun 1884 was based on a mention by Hooker 1834 of Senecio hieraciifolius L. from Saskatchewan. This has never been confirmed and was not accepted by later authors.

47. ARNICA L.

ARNICA

Leaves opposite, otherwise as in Senecio. Tegules isomegueth.

- a. Leaves cordate to narrowly oblong.
 - b. Larger stem leaves broadly cordate and long petiolate, the petiole mostly about as long as the blade; achene abundantly short hirsute 8. A. cordifolia
- bb. Stem leaves oblong to ovate-oblong, subcordate to cuneate at base; petiole less than half as long as the blade.
 - c. Pappus pale brown; leaves closely and sharply dentate 11. A. diversifolia
 - cc. White; leaves somewhat remotely serrate or denticulate; achenes usually glabrous 7. A. latifolia
- aa. Narrower, oblong-lanceolate to linear.
 - d. Stem leaves in (1)-2-3-(rarely 4) pairs ..
..... Group A
 - dd. Stem leaves in (4)-5-6-(8) pairs.
 - e. Leaves closely and sharply dentate ..
..... 11. A. diversifolia
 - ee. Entire to remotely denticulate.
 - f. Tegules lanate-ciliate at tip..
..... 9. A. Chamissonis
 - ff. Tegules much more sharply acute and the ciliation not unusually dense at tip.
 - g. Leaves entire or nearly so; tegule pubescence entirely or essentially of short glandular hairs..... 10. A. longifolia
 - gg. Leaves remotely denticulate; tegule pubescence primarily villous 12. A. mollis

Group A

Stem leaves rather narrow and few; mostly in (1)-2-3 pairs and broadly lanceolate to linear. Pappus mostly

white.

a. Heads discoid; pappus pale brown 13. A. Parryi
 aa. Heads radiate.

b. Heads at first nodding; achene glabrous
 or finely glandular below the middle,
 sparsely pilose above 2. A. louisiana

bb. Erect; achene uniformly pilose; mostly
 taller plants.

c. Leaves remotely and regularly den-
 ticulate with distant and subopposi-
 te teeth.

d. Pappus white 3. A. lonchophylla

dd. Pale brown; tegules longer
 12. A. mollis

cc. Leaves entire or irregularly and remotely
 denticulate.

e. Tegules 9-11 mm long; leaves
 broadly lanceolate 4. A. Rydbergii

ee. Tegules 11-15 mm long.

f. Leaves 1-4 cm wide and near-
 ly uniform in length but the
 middle ones somewhat longer ..
 12. A. mollis

ff. Much reduced upward, the lo-
 west at least twice longer
 than the upper, also mostly
 narrower and lanceolate to
 linear.

g. Rhizome with tufts of long,
 brown hairs; leaves \pm oblan-
 ceolate, the lower at least
 1 cm wide 5. A. fulgens

gg. Rhizome without tufts; leaves
 lanceolate to linear and not
 over 1 cm wide.

h. Ligules light yellow; te-
 gules somewhat acuminate,
 often purplish and squar-
 rose at tip 1. A. alpina

hh. Ligules orange-yellow; te-
 gules broadly acute at tip
 and green 6. A. sororia

1. A. alpina (L.) Olin var. ungavensis Boivin (ssp. attenuata (Greene) Maguire; A. attenuata Greene) -- A middling type, 1-3 dm high with 2-3 pairs of stem leaves and usually only 1 head. Leaves usually less than 1 cm wide, linear-lanceolate, acuminate, entire. Involucre obviously glandular-puberulent and lightly villous, more densely so towards the base. Pappus clean white. Mid

summer. Tundra and rocky alpine slopes and summits. -- K-Aka, L-(NF), nQ-nMan-(nS)-swAlta-nBC -- Var. vestita Hultén (var. tomentosa (J.M. Macoun) Cronq.) -- Densely soft lanate, especially on the tegules and the base of the involucre. Tegules also abundantly, but not obviously, short glandular-pubescent under the heavy lanosity. Ligules rather short, usually of about 1 cm. Less common. --(Mack-Y)Aka, (wNF), swAlta-(BC, nwUS).

Var. ungavensis (Boivin) stat. n., A. Sornborgeri Fern. var. ungavensis Boivin, Nat. Can. 75: 211. 1948.

2. A. louisiana Farr var. louisiana -- Smaller than the last, usually around 1 dm high. Leaves broader, mostly 1-2 cm wide, \pm lanceolate and not acuminate, mostly basal, the stem usually bearing only 1 reduced pair. Head nodding at anthesis and usually solitary. Mid summer. Shale slides at high altitudes in the Banff area. --Y, swAlta-neBC.

Vicariant of the eastern var. Griscomii (Fern.) stat. n., A. Griscomii Fern., Rhodora 26: 105. 1924, from Gaspé and Newfoundland. The latter has erect heads at anthesis. Also it is a somewhat taller plant and its achenes are slightly shorter.

3. A. lonchophylla Greene var. lonchophylla (A. arnoglossa AA.) -- Resembles A. alpina, but somewhat larger and the leaves are remotely denticulate with a few pairs of subopposite teeth. Mostly (2)-3-4-(6) dm high. Upper leaves much reduced and usually entire, the basal ones with a petiole at least half as long as the blade. Involucre often shorter. Early summer. Near shores in limestone regions. --(swK)-Mack-Y, NF, NS, NB-Alta, ncUS.

In ours the herbage is both glandular and long pilose. In the more southern var. arnoglossa (Greene) Boivin the glandulosity is more abundant and obviously dominant while the pilosity is much shorter and scanty, the contrast is especially strong on the tegules where the longer hairs are quite lacking or nearly so.

4. A. Rydbergii Greene -- Somewhat halfway between A. alpina and A. latifolia. Loosely tufted and 1.5-2.5 dm high. Stem leaves mostly 2 pairs of which the upper are broadly lanceolate, the lower broadly oblanceolate, entire to irregularly denticulate. Head usually solitary, the involucre rather short. Pappus clean white. Summer. Low alpine, mostly on shale slides. -- swAlta-(eBC), nwUS.

5. A. fulgens Pursh -- Rhizome with many tufts of long, brown hairs. Pubescence dense, primarily glandular and lightly tinted. Stem leaves 2-3 pairs, the upper much reduced, the lower 2-4 times longer, oblanceolate, entire to irregularly denticulate. Head usually solitary and on a peduncle usually longer than any of the interno-

des. Outer tegules up to 2.5-3.5 mm wide. Early summer. Shallow depressions in the steppe. Infrequent but showy. --swMan-eBC, US.

6. A. sororia Greene --Closely resembling the last, but lacking the tufts of brown hairs at the base of the stem and on the rhizome. Lower leaves not so clearly oblanceolate and tending to narrower, usually less than 1 cm wide. Peduncles less elongate, often shorter than any of the internodes. Tegules somewhat narrower, (1.0)-2.0-(2.5) mm wide. Early to mid summer. Foothill prairies and open montane woods. --sAlta-sBC, (wUS).

7. A. latifolia Bongard (A. gracilis Rydb.) -- A rather large-leaved species with typically two pairs of stem leaves of which the lower are serrate, + oblong and rounded at base to a winged petiole. Basal leaves sometimes cordate. Stem 2-6 dm high. Involucre rather narrow and high, the tegules 12-18 mm long. Pappus pure white. Achaine commonly glabrous, sometimes sparsely puberulent in the upper half, more rarely minutely glandular. Early to mid summer. Wetter montane forests. --swMack-Aka, swAlta-BC, wUS.

Plants from higher altitudes tend to be generally smaller, including smaller heads. A number of names have been proposed for this ecological extreme, the latest being var. gracilis (Rydb.) Cronq. An essentially parallel variation occurs under the next species: var. pumila (Rydb.) Maguire is available to single out such smaller variants of higher altitudes.

8. A. cordifolia Hooker -- A rather showy forest species resembling the last, yet the basal and lower leaves deeply and broadly cordate. Head mostly 5-6 cm across. The petioles elongate and not winged. Tegules 12-20 mm long, 3-5 mm wide, oblanceolate. Pappus white. Late spring to mid summer. Lodgepole forests; common at low altitudes in the Rockies, highly disjunct eastward. --swMack-Y, Man-BC, US.

Recently discovered in the Riding Mountain area (Rassburn Tower Cabin), this cordillerian species also occurs east of the Rockies in a rather unusual and highly disjunct manner: Wintering Hills, Cypress Hills, Pasquia Mountain and Riding Mountain. Also south of the border in the Sweetgrass Buttes of Montana, the Black Hills of South Dakota and the Keweenaw peninsula of Michigan. Many of these isolated localities are in recently glaciated territory, which would indicate a species enjoying a range expansion in earlier post-glacial times followed with a regression to the present highly sporadic condition.

Reports of A. cordifolia for southeastern Alaska by Maguire 1943, Hultén 1950, Anderson 1952, Gleason 1952, Cronquist 1955, queried by Boivin 1967, are apparently

in need of confirmation. The original report was based on a collection by Cushing from Muir Glacier and two Krause collections from Tlehini and Klokwan. The Muir Glacier collection (CU) has the short petioles, the triangular-oblong leaves with broadly cordate base and the small size typical of A. latifolia var. gracilis, and has been revised accordingly. It is not possible to state if the Krause collections should be similarly revised as these were preserved at the Berlin Botanical Garden and were presumably lost in the fire that destroyed their herbarium.

The Keweenaw plant has been described as a separate species, A. Withneyi Fern., which differs in no substantial way from the cordilleran plant, yet the limited Keweenaw populations exhibit, as would be expected, a narrower range of variation than the multitude from the Rockies and westward. Such a restricted type has no taxonomic value by the mere fact of its restricted range and variation. The other 6 isolated localities also support populations of similarly restricted range and variation and would also rate taxonomic rank if either limited variability or localized occurrence were taxonomic characters per se, a situation where the place of collecting would actually become the primary taxonomic criterion.

9. A. Chamissonia Lessing (var. angustifolia Herder, var. incana (Gray) Hultén, ssp. foliosa (Nutt.) Maguire; A. foliosa Nutt.)-- Stem leaves more numerous, mostly in 4-5 pairs. Long stoloniferous and (3)-4-6-(8) dm high. Leaves \pm lanceolate, 1-5 cm wide, remotely denticulate or entire, commonly about as long as the internodes. Lower part of stem often purple. Herbage abundantly long villous and glandular-puberulent. Heads mostly 3-5, corymbose. Tegules broadly acute and lanate-ciliate at tip. Pappus pale brown to nearly white. Mid summer. Low lying patches in black soil regions. --sMack-sAka, wcQ-BC, wUS.

Some average differences are fairly obvious when specimens from opposite ends of the range are contrasted. Thus Alaska specimens (var. Chamissonia) tend to larger stem leaves, (1.5)-2.0-3.5-(5.0) cm wide, more obviously toothed, the pappus usually tawny, varying to nearly white, and Ontario specimens (var. angustifolia Herder) have narrower leaves 1.0-2.0-(3.5) cm wide, entire to weakly toothed, the pappus mostly nearly white. The California specimens (var. incana (Gray) Hultén) are often quite heavily tomentose. However these morphological types are merely statistical variants, they occur with greater frequency in one area without being completely absent from the rest of the range. Most specimens have leaves about 2 cm wide, pappus light tawny, and average

tomentum; it is difficult to sort them out into geographical variants without undue emphasis on the place of collecting. Certainly, a realistic sorting of the material at hand would not achieve the strong geographical restrictions illustrated by a dot map in Brittonia 4: 462. 1943.

The extreme with dense and felty tomentum could be regarded as an ecological form (= f. incana (Gray) Boivin) of wetter years, often found standing in shallow water. The evidence at hand is still too scanty to be conclusive.

10. A. longifolia D.C. Eaton -- Involucre not villos at base, or only slightly so. With 5-8 pairs of stem leaves, lanceolate to narrowly lanceolate, thus resembling the last, but greener, the dense and short glandulosity not being mixed with any villosity. Leaves entire to remotely denticulate, at least as long as the internodes and commonly twice longer, the upper often overtopping the heads, the basal ones absent at flowering. Late summer. Forming large patches along subalpine creeks in Waterton. --swAlta, wUS.

11. A. diversifolia Greene -- Leaves closely and very sharply dentate, the sinuses rounded. Stem leaves mostly in 5 pairs, the larger ones ± ovate, the others gradually shorter and much narrower, mostly petiolate, the petioles winged. Herbage lightly villous and densely glandular-puberulent throughout. Pappus pale brown. Mid summer. On wet cliffs and along subalpine creeks. --(Y)-seAka, swAlta-BC, wUS.

12. A. mollis Hooker var. mollis (A. lanceolata Nutt.) -- A middling and non-descript type with 3-4 pairs of stem leaves, nearly entire to serrate, ± lanceolate, 1-4 cm wide. Pubescence mixed, partly glandular-puberulent, partly villous or glandular-villous. Pappus pale brown. Second half of summer. Wet or boggy places in the mountains. -- (swMack-seY), nNB-seQ, swAlta-sBC, wUS -- Var. aspera (Greene) Boivin (A. amplexicaulis Nutt.) -- More leafy, mostly with 5-6 pairs of stem leaves. -- (wMack, seAka), swAlta-BC, wUS.

Var. aspera (Greene) stat. n., A. aspera Greene, Ott. Nat. 15: 281. 1902.

Another variant from the U.S. Northwest is var. Piperi (St. John & Warren) stat. n., A. amplexicaulis Nutt. var. Piperi St. John & Warren, Proc. Biol. Soc. Wash. 44: 36. 1931, distinguished mainly by its more ample foliage, the leaves up to 4-6-(8) cm wide.

One of the more remarkable cases of range disjunction in North American, widely distributed in the Rockies and again around the Gulf of St. Lawrence. A Great Lakes report by Macoun 1903 was based on a sheet

labelled, R. Bell, Gros Cap, July 25, 1860 (QK); it is to be discounted as the specimen belongs to Coreopsis lanceolata var. lanceolata.

13. A. Parryi Gray var. Parryi -- Discoid. Similar in habit to A. fulgens. Lower and basal leaves lanceolate, broadest near the base, long petiolate. Middle and upper stem leaves strongly contrasting, less than half as long and sessile. Heads commonly 3-5 and fairly large, but rayless. Mid summer. Mountain meadows towards timberline. --(Y), swAlta-sBC, wUS.

In the more southern var. Sonnei (Greene) Cronq. the heads are radiate.

48. SENECIO L.

GROUNDSEL

Mostly a conspicuous herb with yellow heads in a terminal corymb, often in an umbelliform corymb. A basic type, resembling Solidago with its yellow flowers and ligules and its pappus of bristles, but the tegules isomegueth and more or less in a single row, or sometimes dimegueth, the outer ones few in number and many times shorter than the inner.

- a. Monocephalous or annual Group A
- aa. Perennial and polycephalous.
 - b. Leaves subentire to dentate Group B
 - bb. Some or all leaves coarsely lobed to pin-natifartite Group C

Group A

Annual herbs, usually polycephalous. Or perennial but monocephalous or sometimes with a second smaller head.

- a. Annual.
 - b. Annual from a bulbous base with fasciculate rootlets 4. S. congestus
 - bb. Annual with a taproot.
 - c. Herbage nearly glabrous; outer tegules black-tipped 1. S. vulgaris
 - cc. Herbage heavily glandular; all tegules green to the tip 2. S. viscosus
- aa. Perennial.
 - d. Leaves subentire; head largest 5. S. megacephalus
 - dd. Lower stem leaf deeply lobed 17. S. resedifolius

Group B

- Leaves subentire to dentate or serrate.
- a. Head largest, solitary or nearly so 5. S. megacephalus

- aa. Polycephalous, with more than 2 heads.
 - b. Leaves \pm isomegueth, \pm truncate at base ..
..... 7. S. triangularis
- bb. Lower leaves long cuneate at base.
 - c. Upper stem leaves sessile but otherwise not much smaller than the lower ones.
 - d. Stem leaves much shorter than the internodes and much narrower than the rosette leaves
..... 11. S. streptanthifolius
 - dd. Stem leaves rather longer than the internodes.
 - e. No rosette leaves; main stem leaves \pm obovate..... 6. S. Fremontii
 - ee. Rosette present; stem leaves lanceolate or oblanceolate ..
..... 16. S. tridenticulatus
- cc. Middle and upper stem leaves less than half as long as the lower ones.
 - f. Heads in a corymbiform raceme, rarely somewhat compound; herbage \pm villous or tomentose, at least in the inflorescence..... 9. S. integerrimus
- ff. Outer branches bearing short racemes of 2-5 heads; herbage glabrous or lightly pubescent in the inflorescence 8. S. foetidus

Group C

Polycephalous perennials with leaves more deeply dissected. At least the stem leaves coarsely lobed towards the base, more commonly pinnatifid to pinnatipartite.

- a. Leaves all alike.
 - b. Herb 3 dm high or less; leaves slightly fleshy, dentate to lobed ..16. S. tridenticulatus
- bb. Much taller herb; leaves thin and more deeply dissected..... 3. S. eremophilus
- aa. Leaves polymorphic: rosette leaves larger and usually merely dentate; stem leaves more deeply dissected, the upper ones smaller.
 - c. Basal leaves cuneate at base, usually less than 2 cm wide.
 - d. Herbage grayish to whitish-tomentose, but the leaves sometimes green above.... 10. S. canus
 - dd. Herbage less pubescent and green throughout.
 - e. Rosette leaves uniformly crenate or serrate to base 12. S. pauperculus

ee. Mostly with only 3-5 teeth towards

the apex 11. S. streptanthifolius

cc. At least the larger leaves subtruncate to cordate or broadly rounded at base.

f. Larger leaves cordate or ovate to reniform; heads radiate; tegules green ...

..... 13. S. aureus

ff. Larger leaves more or less truncate at base; heads radiate or eradiate; tegules ± purplish.

g. Herb 2-4 dm high; basal leaves 1-3

cm long 15. S. pauciflorus

gg. Taller and the leaves larger

..... 14. S. indecorus

1. S. VULGARIS L. -- Groundsel (Grand mouron, Toute venue) -- Main tegules green, but the outer short tegules black in the upper third. Leaves ± oblanceolate, irregularly lobed to pinnatifid, the lobes irregularly dentate. Discoid. All summer. Casual weed, rarely abundant. -- (G), Mack-(Y)-Aka, L-SPM, NS-BC, US, Eur.

2. S. VISCOSUS L. -- Stinking Groundsel -- Closely resembling the first, but densely glandular puberulent. Inner tegules with a small brown spot at tip; outer ones green. Ligules very short, the heads almost discoid. Second half of summer and fall. Rare weed of disturbed soils: Winnipeg. -- (NF), NS-Man, BC, (US), Eur.

3. S. eremophilus Rich. var. eremophilus -- No rosettes, but the stem leaves numerous and pinnatifid to pinnatipartite. Fairly showy tufted perennial, (0.6)-1.0-(1.5) m high. Leaf lobes narrower than the sinuses. Heads fairly large and long ligulate. Tegules finely tipped in black. Mid summer. Wetter spots at edge of forests. -- sMack, O-BC, US.

In the southern Rockies our plant gives way to var. Kingii (Rydb.) Greenm. with smaller heads, the involucre only 5-7 mm high, the tegules more conspicuously black-tipped.

4. S. congestus (Br.) DC. (var. palustris (L.) Fern., var. tonsus Fern.; S. palustris (L.) Hooker) -- Marsh-Fleabane -- Annual from a bulbous base. Long-lanate throughout. Stem thick, hollow, up to 1 m high, but usually much smaller. Bulb also hollow. Stem leaves numerous, undulate to pinnatifid. Heads in clusters. Ligules short. Late spring to mid summer. Exundated places. -- F-Aka, L, Q-Alta-(BC), ncUS, Eur.

5. S. megacephalus Nutt. -- Heads largest, 2.0 - 2.5 cm high, and usually solitary or sometimes with a second smaller one borne on a longer peduncle. Herbage tomentose-floccose, especially along the leaf margins.

Leaves entire to dentate, oblanceolate, the upper much reduced. Mid summer. Alpine ridges in Waterton. -- swAlta-seBC, nwUS.

6. S. Fremontii T. & G. var. Fremontii -- A tufted perennial, somewhat fleshy, 1-2 dm high, with a taproot. Herbage glabrous. Basal leaves lacking, the stem leaves fairly uniform, narrowly obovate, dentate. Heads few, mostly 2-3 per stem. Longer tegules of two kinds; every other one broadly hyaline-margined, the others with a narrow margin in pale green. Second half of summer. Rocky alpine slopes. --swAlta-seBC, wUS.

The californian var. occidentalis Gray is more slender and less sharply toothed, while var. blitoides (Greene) Cronq. of the southern Rockies is more robust and its broader leaves are more sharply toothed.

7. S. triangularis Hooker -- Stem leafy with numerous triangular leaves 5-12 cm long, sometimes broadly cuneate but usually truncate at base, serrate at margin. Ligules few and rather long. Otherwise pretty much like S. eremophilus. Mid summer. Open mountain woods and low alpine meadows. --Mack-Aka, swAlta-BC, nwUS.

8. S. foetidus Howell (S. hydrophiloides Rydb.) -- Similar to the next but the lower and basal leaves closely and sharply serrate. Generally larger, especially the basal leaves. Herbage quite glabrous. Tegules with a conspicuous, triangular, black tip. First half of summer. Along low montane creeks -- swAlta-sBC, nwUS.

S. hydrophiloides was some years ago reduced in rank as S. foetidus var. hydrophiloides (Rydb.) Barkley and discussed in Leaflet West. Bot. 9: 103-4, 1960. The more southern and more western parts of the range are said to be restricted to var. foetidus with more numerous heads in an irregular compound corymb of small clusters, the peduncles mostly shorter than the heads. Allowing for a broad zone of overlap, the more northern and the more eastern parts of the range are reputedly occupied by var. hydrophiloides with fewer heads borne in a nearly simple corymb, most peduncles longer than the heads.

Of the four Canadian collections examined, the one from Rossland, B.C., (CAN) fits the distributional pattern by having the morphology of var. hydrophiloides, but the Alberta collections from Milk Range (CAN), Camp Impeesa (DAO) and Waterton (CAN) have the more numerous and clustered heads of var. foetidus. Obviously the Canadian material does not fall into the proposed pattern of geographical varieties. The U.S. material at hand is not sufficient to enable us to form a firm opinion on the tenability of these variations south of our borders.

9. S. integerrimus Nutt. var. integerrimus -- Leaves entire or remotely denticulate in the manner of

some Arnica. Herbage + tomentose or villous, at least in the axils and at the base of the heads. Lower and basal leaves lanceolate, commonly around 1 dm long, the middle and upper ones much reduced. Tegules green to the tip. Ligules yellow. Early summer. Wet or sandy meadows, infrequent and mainly more southern. --Man-BC, US -- Var. exaltatus (Nutt.) Cronq. (S. columbianus Greene; S. exaltatus Nutt.; S. Scribneri Rydb.) -- Tegules with a small black patch at tip, the black patch 1 mm long or less, mostly lanceolate. --S-BC, wUS -- S. ochroleucus (Gray) Boivin -- Ligules paler, white to cream: Manyberries. --Alta-(BC, US) -- Var. lugens (Rich.) Boivin (S. lugens Rich.) -- Black patch larger and more conspicuous, triangular to deltoid and about 2 mm long. -- Mack-Aka, Alta-BC, nwUS.

Var. exaltatus (Nutt.) Cronq. f. ochroleucus (Gray) stat. n., S. lugens Rich. var. ochroleucus Gray. Syn. Fl. 1,2: 388. 1884.

Var. lugens (Rich.) stat. n., S. lugens Rich., Bot. App. to Franklin's Narrative 747-8, 1823.

Var. Parryi D.C. Eaton (=var. exaltatus) was reported by Dawson 1875 for west of the Turtle Mountain towards the first crossing of the Souris river, but the corresponding collection (DAO) belongs to var. integerrimus. See also Scoggan 1957 sub S. pauperculus. To our knowledge, all Manitoba specimen of S. integerrimus belong to the typical variety.

10. S. canus Hooker (S. Purshianus Nutt.) -- Herbage more or less grayish-tomentose. Basal leaves all or mostly entire. Otherwise similar to S. pauperculus var. thompsoniensis. First half of summer. Steppes on hill-sides, frequent. -- (O)-Man-BC, US.

Reputedly introduced eastward in Ontario, but we have yet to see a specimen.

11. S. streptanthifolius Greene (S. cymbalaroides Nutt., var. borealis (T. & G.) Greenman; S. obovatus AA.) -- Lower and basal leaves slightly fleshy, entire except for 3-(5) apical teeth. Otherwise similar to the next. Drier prairies. Late spring and early summer. -- sMack-sAka, nwS-BC, wUS.

S. aureus var. borealis T. & G. was reported by Macoun 1884 for the North West Angle of the Lake of the Woods. This locality is in Minnesota, the Angle being a small geographical inset along the Ontario-Manitoba boundary. The specimen (CAN) was correctly identified and would to-day be called S. streptanthifolius; it was so revised by T.M. Barkley in 1960. However the locality is far out of range and has never been confirmed, raising the suspicion that the label data could be erroneous.

12. S. pauperculus Mx. var. pauperculus (S. Balsemitae Muhl.) -- A middling type, forming an intergrading series with the last two and the next four species. Loosely tufted, (2)-4-(6) dm high, glabrous or tomentose in the leaf axils. Leaves strongly dimorphic; the lower and basal oblanceolate to obovate, mostly 1 cm wide or slightly less, petiolate, crenate or serrate and often pinnatifid towards the base; middle and upper leaves sessile, pinnatifid towards the base. Involucre 4-5 mm high. Early summer. Wet sandy soils and limestone flats in open places. --K-(Mack-Aka), L-NF, NS-Man, US -- Var. firmifolius Greenman (var. flavovirens (Rydb.) Boivin, var. thompsoniensis AA.; S. Tweedyi Rydb.) -- Heads larger, the involucre 5-7 mm high. Herb tending to be larger throughout. Wet meadows. --K-Mack, NF, Q-BC, US -- Var. thompsoniensis (Greenman) Boivin (S. plattensis Nutt.) -- Herbage more or less floccose-tomentose. Stem leaves more often pinnatifid to pinnatipartite for their whole length. Basal leaves usually larger, commonly 1-2 cm wide, crenate to lobed. Heads larger, as in var. firmifolius. -- sMack, O-BC, cUS.

Our Canadian material is fairly readily divisible into three geographical variants, give or take a few intermediates. The more eastern plants are generally smaller and smaller-headed, they constitute the typical variety. The common type in our forested areas, common westward and northward, becoming very local eastward, is a somewhat larger plant with larger heads; it may be known as var. firmifolius. More pubescent plants from the prairie regions and southward are referable, sometimes arbitrarily so, to var. thompsoniensis. All specimens under S. pauperculus at DAO, MT, MTMG, and QFA from west and north of Manitoba were revised to other taxa, mainly to var. firmifolius. Perhaps the western material in other herbaria should be similarly revised and the Mack-Y-Aka reports discounted, just as we are discounting all reports of S. paupercula proper from Saskatchewan and westward.

Canadian reports of, and identifications as, S. Balsemitae generally refer to somewhat larger plants from any of our three varieties, mostly of var. pauperculus.

Var. firmifolius (1905) is apparently the earlier name for the larger-headed plant which we had previously called var. flavovirens (1948) and was called var. thompsoniensis (1911) by Cronquist 1955.

Macoun 1884 reports Senecio aureus L. var. obovatus (Muhl.) T. & G. (S. obovatus Muhl.) as occurring from Nova Scotia to B.C. and throughout the prairie regions. Modern collections show that in Canada, S. obovatus is restricted to two limited areas in Ontario and Québec and Macoun's report for our area is no doubt to be discounted, even if

we have not yet investigated its specimen basis. We expect that most of his western specimens will belong to S. pauperculus var. firmifolius or to S. aureus.

13. S. aureus L. (S. pseudopaeus Rydb., var. semicordatus (Mack. & Bush) Barkley) -- Spring-Avens, Squaw-Weed -- Basal leaves large and short, reniform or broadly ovate to cordate, mostly 2-5 cm wide and broadest at the base which is mostly cordate to truncate or broadly cuneate. Involucre 5-8 mm high. Otherwise similar to the var. firmifolius of the last. First half of summer. Wet meadows. -- NF-SPM, NS-sMan-swS-Alta(se, sw)-BC, US.

A troublesome name, often misapplied, so that literature records should not be trusted too eagerly. Thus the long-standing Labrador record turned out to be based on two Forteau collections (QK) which proved to belong to S. pauciflorus and S. pauperculus respectively.

A highly variable species, difficult to define, not always clearly distinct from its relatives. Numerous variants have been defined and many of these will form the dominant facies of the species in a particular region, but as far as we can determine these variants have primarily a statistical value, being quite common in a particular part of the range, sporadic or local elsewhere.

East of us nearly all specimens of S. aureus have obviously cordate basal leaves and are thus readily distinguished from S. pauperculus; the latter is also noted for its smaller heads and narrower leaves ± cuneate at base. But in our area where the local variant of S. pauperculus is the larger-headed var. firmifolius and where the local facies of S. aureus is a somewhat smaller plant with basal leaves less often cordate than not, the distinction is less obvious and at times merely arbitrary.

The latest student of the group, Barkley 1962, subdivided our Canadian material into three taxa as follows. The more deeply cordate basal leaves characterize the eastern S. aureus, while in the western S. pseudopaeus they are truncate or merely subcordate at base. The eastern phase of the latter is distinguished as var. semicordatus (= S. aureus var. semicordatus (Mack. & Bush) Greenman) in which the basal leaves have rounded teeth. This occurs in southern Manitoba and southward. The more western and typical phase of S. pseudopaeus has acutely serrate basal leaves and occurs from Alberta westward. Gross modo, these distinctions can be applied to our specimens, and so can Fernald's subdivision of the eastern material into five varieties. But either classification leaves behind a large residue of atypical or out-of-range specimens.

To illustrate the low level of conformity between the actual specimens and the described standards, we are

reproducing a count of heads on a series at hand of 18 Alberta and B.C. collections comprising 40 flowering stems. In that area only typical S. pseudoaureus is supposed to occur and it should bear 12-20 heads, as contrasted with the more eastern var. semicordatus bearing only 6-12 heads per plant. The result is as follows in which the first figure is the number of heads, and the figure in brackets is the number of plants from Alberta and B.C. bearing said number of heads: 2(1)-- 3(6)-- 4(4)-- 5(2)-- 6(6)-- 7(4)-- 8(3)-- 9(4)-- 10(1) 14(2)-- 15(2)-- 16(2)-- 17(1)-- 20(1)-- 22(1). Clearly we have two series here: 31 plants have 2 to 10 heads per inflorescence and would be better placed with the Manitoban var. semicordatus; the remaining, a minority of 9 plants, have 14 to 22 heads and conform roughly to the standard of S. pseudoaureus as expected for the area. Obviously, the number of heads per plant has no diagnostic value in the present case. Other criteria have proved to be equally unsatisfactory.

Alleged differences in root system are equally unconvincing, granted that the more western plants tend to have a somewhat thicker and more horizontal rhizome than the eastern plants.

The species is of discontinuous distribution across our area, being apparently restricted to southern Manitoba, the Cypress Hills and southwestern Alberta. We have seen three of the Saskatchewan collections cited by Breitung 1957 as S. pseudoaureus, but we place these in the radiate form of S. indecorus (or S. discoideus), a species not later recognized by Breitung. On the other hand another Cypress Hills collection, Breitung's 4513 (or "4313") falls within our concept of S. aureus. It was originally named and distributed as S. pseudoaureus, but cited by Breitung 1954 as S. indecorus, then in 1957 included in S. pauperculus var. thompsoniensis, finally in 1959 returned to S. pseudoaureus.

Some Alberta and B.C. specimens have oblong-lanceolate basal leaves and would probably have been identified as S. Robbinsii Oakes if they had been collected in the east.

S. aureus grades into the next species, but the two are largely allopatric and generally quite distinct. Typically S. aureus has \pm cordate basal leaves, radiate heads and the involucre is green, although frequently tipped in red, while S. indecorus has ovate basal leaves, discoid heads, and a purplish-tinged involucre. However, smaller plants of S. aureus in our area will quite often have ovate basal leaves, while on occasion these may be subcordate in S. indecorus. Exceptional individuals may be discoid in S. aureus while the radiate form of S. in-

decorus is not infrequent. And exceptional specimens of S. indecorus may have a green involucre. On the basis of the distributional patterns of the typical specimens and of field associations, we judge that specimens that are morphologically intermediate are more likely to relate to S. aureus if the head is discoid and the involucre green, but to S. indecorus if the head is radiate and the involucre purple-tinged. The latter also runs to higher heads. In practice the purplish condition of the involucre is a more reliable characteristic of S. indecorus than its discoid presentation.

14. S. indecorus Greene (S. discoideus (Hooker) Britton) -- Mostly like a larger var. firmifolius and transitional to the next species. Generally a larger plant, usually 6-8 dm high. Leaves broadly lanceolate, mostly pinnatipartite towards the base, the basal ones broadly oval, mostly 2-3 cm wide. Heads discoid. Tegules purplish. Involucre 7-10 mm high. Mid summer. Moist meadows. --(seK)-Mack-Aka, Q-BC, nUS--F. Burkei (Greenman) Fern. (S. pauciflorus Pursh f. fallax (Greenman) Boivin) -- Heads radiate, hence resembling a smaller S. aureus, but the involucre purplish and the ligules rather short, usually not over 5 mm. Occasional and sometimes nearly as common as the discoid form. --Mack-Y, O, S-BC.

Early reports of S. discoideus will be found to apply indifferently to this or the next species. The distinction in two taxa was introduced by Fernald, Rhodora 26: 116-122, 1924, but we disagree with his interpretation of the name S. discoideus. The type of S. discoideus was collected by Richardson at Fort Franklin on the Great Bear River and, working from a photograph, Fernald concluded that it was intermediate but best placed with S. pauciflorus on the basis of the leaf shape, although it resembled S. indecorus in its more numerous heads. Barkley 1962 accepted Fernald's disposal of S. discoideus, but Richardson's track, as mapped by Hooker 1840, lies outside the range S. pauciflorus, Raup's 1947 map as well as Barkley's finely dotted distribution maps show clearly that Hooker's type came from the northern edge of the area of S. indecorus and some 250 miles away from the nearest known occurrence of S. pauciflorus. We judge therefore that the type of S. discoideus cannot but belong with the polycephalous S. indecorus. Further Raup 1947 cited an apparent isotype (CAN) of S. discoideus under S. indecorus. Thus is justified our disposal of S. discoideus as a synonym of S. indecorus, while the more recent reports of S. discoideus should be interpreted mostly as S. pauciflorus.

As a binomial, S. discoideus first appeared in T. & G. 1843 in the discussion of the synonyms, hence was

not validly published at the time. Its valid publication by Britton 1898 is antedated by that of S. indecorus Greene 1897, hence the present choice of correct name.

15. S. pauciflorus Pursh (S. discoideus AA.) -- Involucre 6-8 mm high and nearly always more or less purplish, the ligules nearly always lacking. Mostly 1-4 dm high. Basal leaves less than 2 cm wide, \pm ovate, rounded to broadly cuneate at base. Heads few, mostly 3-5. Disk florets tending to red-orange. Mid summer. Arctic or alpine meadows. -- K-Aka, L-NF, Q-nMan, Alta-BC, US.

This and the last are quite closely related and their intraspecific variability is sufficiently wide that an interspecific hybrid would be difficult to detect and even more so to define. Two of Calder's collections from B.C. and Yukon were distributed as such a hybrid, but by their more numerous heads and higher involucre we judge them to be better placed with S. indecorus.

16. S. tridenticulatus Rydb. (S. densus Greene; S. manitobensis Greerman; S. plattensis AA.) -- Somewhat fleshy and the leaves all similar, all lobed to pinnatifid, and not more deeply so towards the base. Tufted, glabrous, about 2 dm high. First half of summer. Wind-eroded sands, very local. --swMan-(scS), cUS.

A collection from Stewart's lake Mountain, B.C. (CAN) was a syntype of S. manitobensis Greerman, Ott. Nat: 25: 117, 1911 and was mentioned again as S. tridenticulatus in Ann. Miss. Bot. Gard. 3: 180, 1916. The specimen was recently reexamined and revised to S. streptanthifolius.

17. S. resedifolius Less. (S. cymbalarioides Buek; S. subnudus DC.) -- Monocephalous perennial with at least some of the leaves deeply lobed to pinnatifid. Glabrous, 1-3 dm high. Basal leaves ovate, mostly dentate. Lower stem leaves deeply cut, the upper greatly reduced. Tegules green or purplish, glabrous. Ligules often lacking. Early to mid summer. Alpine boggy meadows and shale slides. --wF, wMack--Aka, (NF, seQ), swAlta-BC, (nwUS, eEur).

Further west, there is an endemic variant in the Queen Charlotte Islands: var. moresbiensis (Calder & Taylor) stat. n., S. cymbalarioides Nutt. ssp. moresbiensis Calder & Taylor, Can. Journ. Bot. 43: 1399. 1965, somewhat more pubescent, the involucre being slightly lanate at base, and the rosette leaves more uniformly crenate or serrate right to the base. It was by mistake that in 1967 this variety was listed under S. streptanthifolius.

49. CALENDULA L.

POT MARIGOLD

Achenes all peripheral, strongly curved and either

winged on either side or strongly rugose or acicular dorsally. Heads radiate, the ligulate flowers fertile, the tubular ones sterile and long stipitate, the stipe not dehiscent. No chaff, no pappus.

1. *C. ARVENSIS* L. -- Gools (Souci des champs, Fleur de tous les mois) -- Head fairly large and radiate, like an *Aster*, but yellow and the rather unusual achenes borne only at the periphery. Herbage strongly glandular. Tegules isomegueth, abruptly caudate. Summer and fall. Rare and fleeting escape from cultivation: Brandon.--NB, Man, BC, swUS, Eur.

50. ECHINOPS L.

GLOBE-THISTLE

Head compound, made up of a large number of primary heads, each one reduced to a single floret and its involucre.

- a. Stem tomentose, the tomentum becoming white and compact in the upper part 1. *E. exaltatus*
- aa. Tomentum mixed with numerous long, coloured and glandular hairs 2. *E. sphaerocephalus*

1. *E. EXALTATUS* Schrader -- Rather closely similar to the next. Little if at all glandular. Leaves larger and more narrowly cut, the lobes ± lanceolate. Tegules glabrous on back. Second half of summer. Persisting after cultivation in a city garden at Swift Current. -- swQ-O, swS, swBC, Eur.

2. *E. SPHAEROCEPHALUS* L. -- Globe-Thistle (Boulette, Chardon-boulette) -- Head globular with the receptacle at the centre of the sphere. Leaf resembling *Cirsium* by its cutting and its excurrently spinescent nerves. Heads few, 3-6 cm across, bluish, spinescent, borne on long peduncles. Tegules puberulent dorsally. Mid summer. Sometimes cultivated and rarely spreading to waste places: Otterburne. -- swQ-seMan, BC, (US), Eur.

Reported from Regina and Saskatoon by Bussell 1937, 1944, 1954 and Breitung 1957. We have not been able to tie these reports clearly to any herbarium specimen. Of the two possible sheets located, Dr. G.W. Argus commented (in litt., 1964) on the first one (SASK) "there is no locality or date on this specimen and it seems unjustified to assume that it is of Saskatchewan origin". The other sheet came from Landis (SASKP) and we have revised it to *Bryngium planum*.

51. ARCTIUM L.

BURDOCK

Fruits very catchy as follows: the tegules are attenuate to a fine, hooked point, they are also fused at base and divergent at tip to form a globular unit which becomes very readily detached from its peduncle.

- a. Inflorescence broadly corymbiform, the lower heads on long peduncles.
 - b. Involucre glabrous, 3 cm wide or more 1. A. Lappa
 - bb. Narrower and densely tangled with an arachnoid tomentum 2. A. tomentosum
- aa. Inflorescence a broad panicle of racemes of small clusters; lower heads on peduncles usually short, rarely over 3 cm long.
 - c. Involucre glabrous or glandular 4. A. minus
 - cc. Tegule tips more or less tangled with an arachnoid tomentum 3. A. nemorosum

1. A. LAPPA L. -- Great Burdock, Cukle-Buttons (Grande Bardane, Glouteron) -- Heads largest, 3-4 cm wide, hemispheric and glabrous, forming one or more broad corymbs. Tegules green with ivory tips. Otherwise similar to A. minus. Second half of summer. Waste places and footpaths, a rare weed with us. -- (NS), NB-Man, BC, US, Eur.

2. A. TOMENTOSUM Miller -- Also similar to A. minus, but the inflorescence \pm corymbose and each head is wrapped in a loose cocoon of arachnoid tomentum anchored near the tips of the tegules. Heads subglobose, 2-3 cm wide. Second half of summer. Roadsides and footpaths. --NS, NB-Alta, (US), Eur.

3. A. NEMOROSUM Lej. & Court. -- Heads tangled with an arachnoid tomentum and often larger, up to 3.5 cm wide, and broadly globular, i.e. slightly broader than high. Otherwise pretty much like the next and perhaps not specifically distinct from it. Mid summer. Waste places and footpaths; rare. -- NF, NS, (NB)-Q-Man, Alta-BC, US, Eur.

We have checked specimens from Otterburne (MSM), Saint-Pierre-Jolys (DAO), and Edmonton (DAO).

4. A. MINUS (Hill) Bernh. -- Burdock (Bardane) -- Coarse herb with very catchy fruits which readily become detached from their peduncle to attach themselves firmly to the clothing of the passerby. Basal rosette similar to Rhubarb, but the leaves somewhat smaller, ovate, arachnoid below. Heads 2-3 cm wide, glabrous to glandular, globular-ovoid. Tegules at first green with ivory tips, becoming purplish at maturity. Second half of summer. Waste places and footpaths; infrequent. -- NF, NS-BC, US, Eur.

Some conspicuous foliar anomalies may be found. They are apparently related to tramping or herbicide action.

52. SAUSSUREA DC.

Heads discoid. Pappus long and plumose. Leaves

alternate and not spiny.

- a. Tegules acuminate at tip, isomegueth..... 1. S. nuda
 aa. Dilated at tip into a suborbicular and
 petaloid segment 2. S. glomerata

1. S. nuda Led. var. densa (Hooker) Hultén -- Short perennial with a small terminal corymb of large discoid heads. Usually less than 2 dm high. Leaves many, crowded, lanceolate, \pm dentate, somewhat arachnoid, especially along the margin. Heads 1.5-2.0 cm high. Tegules usually dark purple. Mid summer. High alpine on rocky slopes. --swAlta-sBC.

The typical phase is alaskan and eurasian; its stem leaves are rapidly smaller above, those from the upper half entire and narrowly linear or nearly filiform; it inflorescence overtops the foliage. In our var. densa the upper leaves are much less reduced, being at least half as large and half as long as the lower ones; and the inflorescence is \pm overtopped by the upper leaves.

2. S. GLOMERATA Poiret -- Inner tegules with a petaloid terminal segment, 1-2 mm wide, pink, \pm fimbriate at margin. Stoloniferous perennial up to 4 dm high. Leaves entire, densely glandular-punctate in yellow-brown below. Outer tegules many times shorter than the inner. Late summer. Rare farmyard weed: Debolt near Grande-Prairie. --wcAlta, Eur.

53. CARDUUS L.

PLUMELESS THISTLE

Resembling Cirsium, the leaves similarly spiny. However the pappus is not plumose, but merely short-barbellate.

1. C. NUTANS L. var. VESTITUS (Hal.) Boivin (var. Petrovicii Arènes, ssp. leiophyllus (Petrovic) Arènes; C. Thoermeri Weinm.) -- Musk-Thistle, Nodding Thistle (Cardinal, Chardon aux ânes) -- Large and ferociously spiny herb, usually monocephalous, the head very large. Stem 1-3 m high, spiny from decurrent wings. Leaves spiny and cut in the manner of a Cirsium, glabrous dorsally. Head purple, discoid, 4.0-5.5 cm wide. Tegules large, spiny tipped, becoming reflexed. Lateral heads, if present, smaller, Mid summer. Obnoxious weed of roadsides and pastures, still local but spreading. --Q-S, BC, US, Eur.

Another variety also occurs west of us at Alexis Creek in B.C.; var. macrocephalus (Desf.) stat. n., C. macrocephalus Desf., Fl. Atl. 2: 245. 1798-1800, heads larger, 5-6 cm wide; leaves somewhat arachnoid-pubescent dorsally.

The shape and coloration of the tegules vary and specimens in which the upper and more colourful half is

broader than the lower pale green half have been distinguished as var. macrolepis (Peterm.) Rouy (= C. Thoermeri). This phenotype has been recognized in our area, but its significance, if any, eludes us.

54. CIRSIIUM Miller

THISTLE

Very spiny from the leaf-nerves long-excurrent into needlelike points. Heads large, discoid. Pappus plumose.

- a. Leaves decurrent with spiny wings from node to node and up to the base of the heads..... 1. C. vulgare
- aa. Leaves not decurrent, or at least not in the upper half of the plant.
 - b. Inner tegules ending in a twisted scarious appendage, the outer tegules spine-tipped.. 6. C. Drummondii
 - bb. All tegules sharp-pointed, or spinetipped; heads smaller.
 - c. Involucre 1.0-1.5 cm high 9. C. arvense
 - cc. Heads larger.
 - d. Heads overtopped by the uppermost or subtending leaves.
 - e. Tegules straight, their tips appressed; herbage very long-villous 7. C. foliosum
 - ee. Tegules squarrose, ending in spines directed outward; herbage thinly arachnoid-tomentose 8. C. Hookerianum
 - dd. Heads overtopping the foliage.
 - f. Stem white-tomentose.
 - g. Leaves \pm flat, the lobes lanceolate and narrower than the sinuses..2. C. Flodmanii
 - gg. Leaves strongly crisped, the lobes \pm deltoid and \pm overlapping ... 3. C. undulatum
 - ff. Stem green, not tomentose.
 - h. Tegules ending in a deflexed spine; leaves white-tomentose below.. 4. C. altissimum
 - hh. Tegules merely sharp pointed; leaves only paler green below 5. C. muticum

1. C. VULGARE (Savi) Tenore (C. lanceolatum AA.) -- Bull-Thistle, Scotch Thistle (Gros chaudron, Piqueux) -- Herbage spiny throughout, even the upper leaf surfaces

acicular-hispid. Biennial, mostly about 1 m high and unapproachable. Leaves ± arachnoid below. Heads tending to be overtopped by the upper leaves. Florets purple. Mid to late summer. Rare weed, usually near ditches or creeks. --NF-(SPM), NS-BC, (US, Eur).

The range was extended to Alaska by Hultén 1950 and Anderson 1952, but the main justifying specimen, Anderson 5573, Hyder, 1939 (S) turned out to be a sterile shoot of C. arvense (L.) Scop. Reports from Sitka and Salmon River Glacier have not been investigated.

2. C. Flodmanii (Rydb.) Arthur (C. oblancoelatum Rydb.; C. plattense AA.) -- Long-stoloniferous perennial with the rosette-leaves polymorphic, some of them unlobed and merely spinulose-margined. Stem and lower leaf surfaces covered by a thin and compact tomentum. Upper leaves smaller and less deeply lobed, often unlobed even. Involucre narrowly campanulate, 2.0-2.5 cm high, 1-2 cm wide at base in the herbarium. Florets pinkish. Seeds 3.5-5.0 mm long. Mid summer. Common in prairies. --swQ-Alta, US -- F. albiflorum D. Löve -- Florets white or cream-coloured. -- Man-Alta, US.

Rather variable and herbarium specimens seem to be readily confused with the next. In the field the difference is quite striking. The few rosette-leaves of C. Flodmanii are in part flat and unlobed. The heavily crisped leaves of C. undulatum are all equally lobed and gathered into dense rosettes. Both species may seem to be biennial, but some patient digging (or a handy road cut) will reveal deeply buried and rather extensive root-connections.

3. C. undulatum (Nutt.) Sprengel var. undulatum (var. megacephalum (Gray) Fern.; C. Engelmännii AA.) -- Woolly Thistle -- Much like the last and not so obviously stoloniferous, but all the leaves cut alike and all strongly contorted in the sinuses. Upper leaves are gradually smaller. Heads larger, campanulate to hemispheric, 2.5-3.0 cm high and 2.0-3.5 cm wide at base in the herbarium. Florets purplish-red. Seeds 5-7 mm long. Summer. Drier prairies and steppes, from Dalny westward. --swMan-BC, US -- F. album Farw. (C. brevifolium AA.) -- Heads white: Milden, Maple creek. --swS, US.

Often mentioned for Manitoba but all collections examined appear to have been misidentified except the following: Boivin 13434, rivière Souris à l'ouest de Dalny, écorce de la coulée, 3 juin 1960 (DAO).

A more western var. Franktonis Boivin has pink flowers and smallish heads as in C. Flodmanii, but the seeds are larger as in C. undulatum. The technical justification: C. undulatum var. Franktonis var. n., capitulis modo minoribus; involucre 2.0-2.5 cm alt.; corolla rosea, post

anthesim albescens; sed semina \pm 6 mm long. et ceteris praecipue ad C. undulatum vergens, attamen foliis saepius minus crispatis. Typus: Calder & Savile 9838, at foot of Mt. Anarchist, just east of Osoyoos, common in open sagebrush slopes above lake; June 29, 1953 (DAO). Paratypi omnes ex DAO: Calder & Savile 10397, Spences Bridge; J.W. Eastham 15914, Fairmont Hot Springs; Beamish, Vrugtman & Kallio 9183, Copper Rd. Mt.; J. Fletcher, Kelowna; V.C. Brink 40-811, Kamloops; Calder & Savile 11353, Fairmont Hot Springs; W.H. Brittain, Vernon; Mulligan & Woodbury 1988, Vernon; Senn, Frankton & Gillett, Cascade; Mulligan & Woodbury 1796, Lilloet; Mulligan & Woodbury 1931, Penticton; Calder, Parmelee & Taylor 19115, Williams Lake.

Named after Dr. C. Frankton, a long time student of the genus.

4. C. altissimum (L.) Sprengel var. discolor (Muhl.) Fern. (C. discolor (Muhl.) Sprengel) -- Leaf surfaces strongly contrasted: white-tomentose below, dark green and lightly villous above. A rather middling species with pinnatifid to nearly pectinatifid leaves, strongly scabrous above. Stem green, mostly 1-2 m high, with very large basal leaves. Late summer. Wet meadows and marshy shores: Emerson, --swQ-scMan, US.

The Emerson (DAO) collection is the only one seen. Old reports for our area of Cnicus altissimus var. discolor and of Cirsium altissimum should probably not be interpreted in the sense of the above var. discolor. Dawson's 1875 report for the Rockies undoubtedly meant something else. And his Turtle Mountain report is probably based on C. Flodmanii, if we are to judge from a Burgess collection (TRT) made 5 days later. The Winnipeg report by Macoun 1897 was based on a sheet that either did not survive or else has been revised since to something else, possibly C. Flodmanii.

In the typical and more southern var. altissimum the leaves are less deeply cut, being merely serrate to lobed. The two varieties are reported to be completely intergradient in their area of sympaty, but all the Canadian material examined was clearly referable to var. discolor.

5. C. muticum Mx. -- Dunce-Nettle, Horsetops -- Tegules not ending in a squarrose spine, but the middle and outer ones merely mucronate while the inner ones are attenuate into petaloid and scarious tips. Main leaves pinnatifid, arachnoid below, weakly acicular-ciliate. Heads purplish. Tegules arachnoid. Mid to late summer. Marshy or boggy places. --L-NF-(SPM), NS-cS, US -- F. lactiflorum Fern. -- Flowers white. Wallwort. -- NF, Q, S.

6. C. Drummondii T. & G. (C. foliosum AA.; C. Hillii AA.) -- Head largest, 5-8 cm across and typically so-

litary, its involucre \pm 4 cm high. Stem low, thick, fistulous, easily crushed, sometimes lacking, often short, always very leafy and the leaves rather long, the upper overtopping the inflorescence. Herbage long villous. Heads sometimes more than one, then 3-5 in a terminal cluster, the lateral heads smaller. Shortly before mid summer. Chernozems at forest margin; infrequent. -- sMack, wO-eBC, ncUS.

7. C. foliosum (Hooker) DC. var. foliosum -- Somewhat like the last, but the heads not quite so large and the corollas whitish. Herbage also quite similar to the last and similarly long villous. Leaves very numerous and the upper much overtopping the inflorescence. Heads always many in a crowded terminal cluster. Involucre 2.0-2.5 cm high, the tegules all spine-tipped. Pappus pale brown or grayish and conspicuous, overtopping the corollas. Mid summer. Mountain meadows, down to lowland meadows northward. --sMack-(sY), sAlta-BC, US.

Leaves mostly green and pilose below, or sometimes \pm white-tomentose. Tegules all appressed. Further east there is a highly isolated var. minganense (Vict.) stat. n., C. minganense Vict., Mém. Soc. Roy. Can. 19: 81. 1925, which has the pappus only as long or slightly shorter than the pink corollas. Also the rosette leaves are white-tomentose below; stem leaves variable, mostly pilose below; inner tegules squarrose, twisted and slightly dilated towards the tip. Known only from the shores of some of the Mingan Islands in the Gulf of Saint-Lawrence.

Var. minganense has also been treated as an outright synonym of C. scariosum in Can. Journ. Bot. 45: 1742. 1967, although it presents itself more like a variety intermediate between C. foliosum and C. Hookerianum. It is quite close to C. foliosum because of its habit, its denser inflorescence and its grayish pappus. It shown some affinity to C. Hookerianum in its tomentose pubescence, its short pappus, its squarrose inner tegules and somewhat larger seeds.

8. C. Hookerianum Nutt. var. Hookerianum - Heads also whitish like the last but the pappus not so conspicuous, being overtopped by the corollas. Pubescence more tomentose and at least the lower leaves white-tomentose below. Inflorescence very variable, corymbose or paniculate to monocephalous, typically racemosely paniculate with a terminal cluster of \pm 3 subsessile heads and many axillary clusters of 1-3 heads on short peduncles. Tegules glandular and the middle ones somewhat villous and long ciliate, the outer and middle ones arachnoid-tomentose. Pappus white and shorter. Summer. Shale slides and alpine or subalpine meadows. --swAlta-BC, US -- Var.

scariosum (Nutt.) Boivin (C. scariosum Nutt.) - Tegules not squarrose, except the inner, and less pubescent, merely glandular or the outer somewhat arachnoid-tomentose. From the Crowsnest southward. --swAlta, nwUS.

Var. scariosum (Nutt.) stat. n., C. scariosum Nutt., Trans. Am. Phil. Soc. 7: 420. 1841.

9. C. ARVENSE (L.) Scop. (var. integrifolium Wimm. & Grab., var. mite Wimm. & Grab., var. vestitum Wimm. & Grab.) -- Canada Thistle (Chadron, Chaudron) -- Heads smallest. About 1 m high and growing in dense colonies. Heads at first few and corymbose, becoming many and narrowly paniculate. Inner tegules not spiny, the outer very short spiny. Florets purplish. Mid to late summer. Common and invading weed. -- G, Mack, Aka, NF-SPM, NS-BC, US, Eur, (Afr) -- F. ALBIFLORUM (Rand & Redf.) R. Hoffm. -- Heads white-flowered -- NF, NS-BC, US, Eur.

54. SILYBUM Adanson

MILK-THISTLE

Resembles Cirsium but the pappus bristles are not plumose, not even barbellate, and the tegules are constricted towards the middle to delimitate two segments, the upper spiny-tipped as in Cirsium, the lower acicular-ciliate.

1. S. MARIANUM (L.) Gaertner -- Milk-Thistle, Lady's Thistle (Chardon-Marie) -- Like a huge Cirsium and the leaf nerves, except the midnerve, outlined by a broad white strip. Foliage spiny in the Cirsium manner, but huge, the lower leaves 5-10 dm long. Heads very large, the terminal 5-8 cm wide. Mid summer. Rare and fleeting weed of cultivated ground, sometimes seeded in as an ornamental. --NS, NB-O, S, BC, US, SA, Eur.

56. CENTAUREA L.

STAR-THISTLE

Tegules, at least the inner ones, more or less clearly differentiated into a lower and an upper segment in the manner of the last genus. Terminal segment palmately lobed or fimbriate, the fimbriae sometimes spinescent. Herbage otherwise not spiny. Pappus variable, chafy or bristly or none. This genus not readily defined except that the achenes are attached obliquely to the receptacle.

a. Involucre long-spiny 2. C. solstitialis
aa. Not spiny, sometimes with short acicules.

b. Leaves pinnatipartite to bipinnatipartite;

flowers yellow 1. C. diffusa

bb. Entire to dentate; flowers pink or blue.

c. Florets blue, the peripheral ones

much enlarged 3. C. Cyanus

cc. Pink and all alike 4. C. repens

1. *C. DIFFUSA* Lam. -- Tip of tegule pectinate, the lobes very stiff, the central one 2-3 times longer and almost acicular. Biennial, often tufted, very scabrous. Leaf segments 1-2 mm wide. Heads narrow, the involucre about 1 cm high. Corollas sometimes fading pink. Mid summer. A railway weed at Grassy Lake. --sAlta-BC, US, Eur.

2. *C. SOLSTITIALIS* L. -- Barnaby's Thistle, Yellow Star-Thistle (Chardon doré, Auriole) -- Non spiny herb except for the heads ferociously armed with yellow spines. Herbage tomentose. Stem winged from the decurrence of the linear leaves. Spines widely divergent, the main ones longer than the body of the head. Florets yellow. Late summer and fall. Rare garden weed: Shellmouth, Ogema, Scott. --sO-S, US, (Eur).

3. *C. CYANUS* L. -- Cornflower, Bluebottle (Bleuet, Barbeau) -- Peripheral florets much longer and much larger than the inner ones, simulating a blue head radiate in blue. Narrow-leaved annual. Middle and inner tegules narrowly lobed at tip. Summer and fall. Casually reseeding itself along roadsides and waste places after cultivation. --NF, NS-Man, Alta-BC, US, Eur.

4. *C. REPENS* L. (C. Picris Pallas) -- Russian Knapweed, Turkestan-Thistle -- Tegules ciliate at tip, the inner ones abruptly contracted into a long, plumose bristle. Perennial from long and deeply buried stolons. Main leaves dentate, the others entire and much smaller. Heads pink, few, in a corymbose inflorescence at the end of long and leafy branches. Mid summer to early fall. Uncommon weed of fields. --O-BC, US, Eur.

57. CICHORIUM L.

SUCCORY

Florets all ligulate, but the pappus not plumose, a mere ring of small scales. Flowers blue.

a. Heads all or mostly longer than their bracts ..

..... 1. *C. Intybus*

aa. Bracts much longer 2. *C. Endivia*

1. *C. INTYBUS* L. -- Chicory, Blue Sailors (Chicorée, Chicorée sauvage) -- A branchy and nearly squeletic perennial with large, blue, ligulate flowers. Milky juice white. Rosette leaves large, \pm runcinate, the cauline ones few and much reduced. Flowers in small, distant glomerules with bracts mostly under 1 cm long. Outer tegules reflexed, at least after flowering. Pappus minute. Mid to late summer. Casual weed of roadsides, waste places and neglected gardens. -- L-SPM, NS-BC, US, SA, Eur.

2. *C. ENDIVIA* L. -- Endive (Chicorée endive) -- Similar but the inflorescence more leafy, the glomerules being

subtented by triangular bracts mostly 2-5 cm long. Pappus up to 1/2 as long as the seed. Mid summer. Rare escape: Kinistino, Lethbridge --S-Alta, Eur.

58. LAPSANA L.

NIPPLEWORT

Like the last, but the flowers pale yellow and the pappus lacking or vestigial.

1. *L. COMMUNIS* L. -- Nipplewort, Swine's Cress (Herbe aux mamelles, Saune blanche) -- Tegules dimegueth, the inner about 8 in number and 5-6 mm long, the outer about 5 and \pm 1 mm long. Herbage hirsute. Upper leaves lanceolate and sessile, the middle ones ovate with a narrowly winged petiole, the lower ones lyrate-pinnatipartite. Heads small in an open inflorescence. Mid summer to fall. A rare weed of shaded places, reported from Winnipeg. -- G, Aka, NF, NB-O-(Man), BC, US, Eur.

59. MICROSERIS D. Don

Scapose or nearly so and generally resembling Agoseris, but the pappus subsessile. One species is atypical, the achenes being tapered at tip.

a. Leaves all basal; tegules isomegueth

.....2. *M. cuspidata*

aa. At least one stem-leaf; tegules strongly

dimegueth 1. *M. nutans*

1. *M. nutans* (Meyer) Schultz-Bip. -- Herbage somewhat farinose-puberulent with small vesicular hairs resembling those of Chenopodium. Habit of Crepis, but the stem leaf (or leaves) borne towards the base. Stem often becoming branchy. Leaves eciliate, long-linear and entire or more commonly pinnatipartite, the lobes few, narrow and remote. Involucre 1-2 cm high, the inner tegules at least twice as long as the outer. First half of summer. Open slopes in the mountains: Waterton. --swAlta-BC, wUS.

2. *M. cuspidata* (Pursh) Schultz-Bip. -- (Agoseris cuspidata (Pursh) Raf.; Nothocalais cuspidata (Pursh) Greene) -- Leaves tomentose-ciliate. Peduncle \pm tomentose towards the summit. Pretty similar to Agoseris but the latter flowers later and its leaves are eciliate. Mid spring. Steppes on hillsides. --swMan-sS-sAlta, US.

Rather uncommon, and often confused with Agoseris, the latter eciliate. Most early reports are to be taken with a grain of salt. We know of only one Alberta sheet, a Dawson collection from the Milk River (CAN), but we have checked 5 or 6 from Saskatchewan. For Manitoba we have checked collections from south of Minto (CAN) and Brandon (DAO). An early report from Fort Ellice (MTMG) by Macoun 1884 was more recently listed as Agoseris agrestis by Scoggan 1957; it has since been revised to A. glauca. A report from Kleefeld by Löve 1959 has not

been checked.

60. KRIGIA Schreber

DWARF DANDELION

The pappus appendages dimorphic, the 5 outer ones being very short, hyaline and inconspicuous scales, while the numerous inner ones are capillary bristles. Achenes beakless.

1. K. biflora (Walter) Blake (K. amplexicaulis Nutt.) -- Cynthia, False Dandelion -- Subscapose perennial, the leaves mostly basal, but with 1 stem leaf or at least with 1-3 bracts subtending the forks. Herbage glabrous or the peduncles glandular. Leaves resembling Agoseris. Heads few, yellow, the upper 3 on subequal peduncles. Tegules about 10, isomegueth, 7-10 mm long. Late spring. Open sandy woods, rare: Teulon and region. --swO-Man, US.

61. HYPOCHAERIS L.

CAT'S EAR

Receptacle chaffy. Pappus of plumose bristles at the end of a thin long beak. Tegules strongly imbricated.

1. H. RADICATA L. -- Cat's Ear, Fall-Dandelion, (Salade de porc, Herbe à l'épervier) -- Stems and branches bearing many very small bracts; the leaves all basal and very coarsely hirsute. Resembles Crepis runcinata, but the latter has a sessile pappus and nearly glabrous leaves, or at least less pubescent than the inflorescence. Peduncles very long, glabrous, slightly thickened upwards. Tegules dark green with a pale green midnerve which becomes purplish and thickened or barbed towards the tip. Outermost tegules very small and forming an ill-defined calycul. Ligules yellow, but the outer ones green dorsally. Late summer and early fall. Rare garden weed: Scott. --(Aka, NF)-SPM, NS, NB-O, S, BC, US, SA, Eur.

62. PICRIS L.

Leafy-stemmed herb with a pappus of plumose bristles borne at the end of a very long beak. Tegules dimegueth or dimorphic.

1. P. ECHIOIDES L. var. ECHIOIDES -- Ox-Tongue (Langue de boeuf) -- Outer tegules rather large, triangular-cordate and acicular-hispid, especially acicular-ciliate. Herbage acicular-hispid throughout, almost like some Borage. Stem leaves alternate, becoming subopposite or subverticillate in the inflorescence. Outer tegules 5-8 mm wide and 1-2 cm long, the inner narrower and lanceolate. Late summer and fall. Rare weed of waste places: Prince Albert, Grande-Prairie. --(NS), NB, O, S-Alta, US, SA, Eur.

Ours is the typical plant with an involucre \pm 1 cm high and dimorphic pubescence, the longer and black hairs being \pm 1 mm long. The beringian var. kamtschatica (Led.) stat. n., P. kamtschatica Led., Mem. Ac. Imp. Sc. St. Pet. 5: 557. 1815 is a generally coarser plant, the coarse black hairs \pm 2 mm long, and the involucre 12-14 mm high.

63. STEPHANOMERIA Nutt.

Pappus bristles plumose, otherwise quite similar to Lygodesmia and perhaps better united with it. Barbs of the pappus 0.5-1.0 mm long.

1. S. runcinata Nutt. (S. tenuifolia AA.) -- Much like the common Lygodesmia juncea, but a bit more leafy and the main stem leaves runcinate-pinnatifid. Pappus pure white. Early to mid summer. Rolling steppes and badlands, rare. --swS-swAlta, nwUS.

S. tenuifolia (Torrey) Hall occurs in Canada only in British Columbia. Its leaves are filiform and entire or merely denticulate. All specimens so named from our area turned out to have the broader and more deeply cut leaves of S. runcinata.

S. minor (Hooker) Nutt. was also reported by Dawson 1875 and Macoun 1884, but the justifying collection from south of Wood Mountain (DAO, TRT) has since been revised to S. runcinata. See the Blue Jay 23: 41-42, March 1965.

64. TRAGOPOGON L.

GOAT'S BEARD

Barbs of the pappus bristles very long and crinky, becoming entangled at tip with the barbs of the next bristle. Seed rather large, long beaked, its bristles spreading horizontally into a conspicuous little parachute.

a. Flowers purplish red 1. T. porrifolius
aa. Yellow; seeds with shorter beak.

b. Peduncle gradually thickened upward,
becoming about twice thicker near the
summit 2. T. dubius

bb. Peduncle of uniform thickness... 3. T. pratensis

1. T. PORRIFOLIUS L. -- Salsify, Oyster-Plant (Salsifis) -- Largely similar to the next two. Ligules purplish red, drying dark purple blue. Heads larger, up to 8 cm in flower or fruit. Peduncle \pm enlarge upwardly. Involucre 3.5-5.5 cm high, at least in fruit. Seed 2.5-4.0 cm long, excluding the pappus, but including the beak which is longer than the body. Pappus very light brown, nearly concolourous with the achene. Late spring to mid summer. Rare weed of rights of way. --(NS), Q-Man, Alta-BC, US, (Eur).

2. *T. DUBIUS* Scop. (*T. major* Jacq.) -- Flowers yellow like the next, but the peduncle gradually enlarged upward to 4-8 mm across. Leaves not so strongly falcate. Involucre 3-6 cm high. Seed 2.5-3.5 cm long, the beak shorter than the body. Pappus whitish, lightly tinted gray. Summer. Frequent weed, even invading native prairies in places. --Mack, NS, Q-BC, US, (Eur).

3. *T. PRATENSIS* L. -- Goat's Beard, Jack-Go-to-Bed-at-Noon (*Salsifis blanc*, *Barbe de bouc*) -- Leaves longest, attenuate; tegules relatively longest; parachute-seed largest. Leaves grass-like, falcate-recurved, the long attenuate tip longer than the \pm lanceolate base. Peduncle elongate, about 2 mm thick. Involucre 2-4 cm high, at least equalling the florets. Fruiting heads \pm 5 cm wide. Achene 1.5-2.5 cm long, the beak shorter than the body. Summer. Rare weed of disturbed soils: North Kildonan, Calgary. --NS-Man, Alta-BC, US, Eur.

65. *TARAXACUM* L.

Scapose herb with a rosette of runcinate leaves and a globose head of umbrella-like seeds. Ribs of the seed covered towards the summit with short acicules. Pappus bristles minutely scabrous.

Both in Europe and in America, the species concept in this genus has been miniaturized. About 1000 microspecies were described and named during the 1940-65 period alone. In our 1962 survey of literature and major herbaria, we found the *Taraxaca* of Canada, Greenland and Alaska filed under 112 different specific names. No overall treatment exists for our area and none seems forthcoming. The effective recognition of these finer segregates is practically restricted to a few skilled botanists with access to the specialized literature of the genus and a good collection for comparison. We have found the recognition of the segregates to be a very fascinating and sometimes frustrating herbarium exercise. But the intellectual import of the exercise has eluded us.

As far as our experience goes, three names will account satisfactorily for the variation to be encountered in our area, all the native plants being versed into *T. ceratophorum*.

a. Tegules ascending or appressed3. *T. ceratophorum*
aa. The outer ones strongly squarrose and reflexed.

b. Achene stramineous to brown; leaves more shallowly lobed upward 1. *T. officinale*

bb. Achene becoming reddish brown at maturity;
leaves uniformly and more deeply lobed ..
..... 2. *T. laevigatum*

1. *T. OFFICINALE* Weber -- Dandelion, Faceclock (Pissenlit) -- Seeds umbrella-like in a globose head. Scapose perennial with abundant milky juice, a rosette of runcinate leaves and monocephalous scapes. Leaves more deeply and more narrowly lobed towards the base, the upper lobes shorter and broader, the terminal one by far the largest. Beak 0.8-1.5 cm long. Mid spring to frost, mainly late spring. Common weed of lawns and tramped or grassy places. --Mack, L-NF, NS-BC, (US, Eur).

2. *T. LAEVIGATUM* (W.) DC. (*T. erythrospermum* Andrzej.) -- Seed red brown, the base of the beak also red brown. Resembles the above species. Leaves pinnatifid to pinnatipartite, the lobes rather narrow and fairly uniform in size, the terminal one not particularly larger. Beak 0.4-1.0 cm long. Second half of spring. Infrequent weed of shaded or tramped places. --Mack, NS, NB-BC, (US, Eur).

3. *T. ceratophorum* (Led.) DC. (*T. dumetorum* Greene; *T. eriophorum* Rydb.; *T. lacerum* Greene; *T. lapponicum* Kihlm.; *T. lyratum* (Led.) DC.) -- Like the above two but the tegules neither squarrose nor reflexed. Leaves variable. Tegule tip varying from flat and acute to irregularly shaped or verrucose or bullate or corniculate. Early to mid summer. Native in semi-open ground of open places. --(G)-F-K, (Aka), L-(NF), Q-BC.

66. SONCHUS L.

Achenes strongly flattened. Pappus sessile, of smooth capillary bristles. Stem leafy, the leaves auriculate-clasping, acicular-toothed.

a. Terminal leaf lobe deltoid; auricles triangular, acute 2. *S. oleraceus*
aa. Terminal lobe ovate to lanceolate; auricles broadly rounded.

b. Perennial; leaves mostly borne near the base of the stem 1. *S. arvensis*

bb. Annual; stem fairly uniformly leafy 3. *S. asper*

1. *S. ARVENSIS* L. var. *ARVENSIS* -- Sow-Thistle (Chaudron-jaune, Crève-z-yeux) -- A coarse herb with spinulose-margined leaves and yellow heads 3-5 cm wide in flower. Perennial from deeply buried rhizomes. Leaves mostly borne near the base of the stem, runcinate-lobed, the middle and upper unlobed, much smaller and much more remote. Inflorescence glandular hispid. Involucre 1.5 cm high or more. Summer. Common weed of cultivated ground and wet places. --Aka, NF-SPM, NS-BC (US, Eur) -- Var. *GLABRESCENS* C., G. & W. (*S. uliginosus* Bieb.) -- Inflorescence glabrous or at least not glandular, but only

finely tomentose in places. --Mack, NS-BC, (US, Eur).

Despite a difference in chromosome number (54 for arvensis and 36 for glabrescens) our two variants fall short of the minimum morphological differentiation to justify specific rank. The intervarietal hybrid, named X var. Shumovichii Boivin, has been found in Ontario and is likely to turn up in our area; it has intermediate vestiture and chromosome count, it backcrosses readily with the parental types to produce a sliding scale of chromosome counts and pubescence density.

2. S. OLERACEUS L. --Milk-Thistle (Chardon blanc, Laiteron) -- Terminal leaf lobe deltoid, about as wide as long. Stem about evenly leafy, the middle leaves often largest, mostly pinnatifid, the margin not quite so sharply acicular as the first, the basal auricles narrowed to acute tips. Annual. Involucre about 1 cm high. Achenes finely rugulose, the rugosities in transverse rows and about as obvious as the weak longitudinal nerves. Mid summer to early fall. A weed, mainly of backyards, waste places and gardens. --Mack, (Aka), NF-SPM, NS-BC, US, Eur.

There are many reports for Saskatchewan, but their basis remains largely obscure. A Saskatoon (SASK) collection in 1917 originally identified as S. arvensis var. glabrescens proved to be our first definite sheet of S. oleraceus for the province. Also reported as a greenhouse weed at Regina. The Langham report (SASKP) has been revised to S. asper. Other reports could not be substantiated, but a recent collection by Hudson at Saskatoon (DAO) is confirmed herewith.

3. S. ASPER (L.) Hill -- (Chaudronet) -- Resembles S. arvensis, but annual and the involucre only 1.0-1.4 cm high. Leaves more evenly spaced, although the upper are smaller and the internodes longer. Auricles strongly recurved, almost spirally coiled. Achene with 3 nerves on each side, otherwise smooth or nearly so. Mid summer to early fall. Weed of waste places and beaches. --Y-Aka, L-(NF)-SPM, NS-BC, US, Eur.

67. LACTUCA L.

LETTUCE

Differs from Sonchus by the beak (or top) of the achene being dilated into a disk on which the pappus is borne. Habitally quite similar to Sonchus.

a. Perennial with large blue heads 5. L. tatarica
aa. Annual or biennial with narrow heads.

b. Leaves acicular dorsally along the midnerve.

c. Involucre 10-13 mm high 1. L. Serriola

cc. Larger, 17-23 mm high 4. L. ludoviciana

bb. Midnerve smooth.

d. Pappus dirty gray to brown..... 7. L. biennis
dd. White.

e. Leaves, and especially the bracts,
broadly cordate clasping at base ..
..... 2. L. sativa

ee. Bracts, and also usually the leaves,
winged-petiolate or tapered at base.

f. Pappus on a long and thin beak;
panicle narrow, crowded, + lan-
ceolate 3. L. canadensis

ff. Pappus sessile; panicle ample,
broad and open 6. L. floridana

1. L. SERRIOLA L. (f. integrifolia (Bogenh.) G. Beck, var. integrata G.& G.; L. Scariola L.; L. virosa AA.) -- Prickly Lettuce (Plante boussole, Escarole) -- Leaves with a row of stiff acicules on the back of the midnerve. Leaves lobed or not, spinulose-margined, on sunny days becoming twisted into a common vertical plane. Inflorescence ample, heads very narrow, yellow, often drying blue. Mid summer to early fall. Waste places, uncommon. --(NS)-PEI-BC, US, Eur, (Afr).

2. L. SATIVA L. -- Lettuce (Salade, Laitue) -- Leaves broadly flabellate or obovate, cordate-clasping at base, passing into the numerous cordate bracts. Somewhat spinulose-toothed along the leaf margins but not along the midnerve. Heads small, numerous, tending to become corymbose. Late summer and early fall. Commonly cultivated; rarely and fleetingly spontaneous: Fort Saskatchewan. --O, Alta, (US, Eur).

3. L. canadensis L. (var. latifolia Kuntze, var. longifolia (Mx.) Farw., var. montana Britton; L. integrifolia Big.) -- Devil's Weed (Chicorée blanche) -- Very variable, the leaves sometimes narrowly lanceolate, entire and clasping at base, but typically they are pinnatifid with a winged petiole. Inflorescence leaves and bracts attenuate at base. Involucre 10-15 mm high. Pappus white, borne on a filiform beak. Early summer. Dry, open places. --NS-seMan, seBC, US.

Reported by Groh 1950 for Eastend, Sask. The justifying specimen (DAO) has since been revised to L. tatarica var. heterophylla. The source of the Saskatchewan reports by Fernald 1950, Gleason 1952 and Scoggan 1957 is still to be traced. These may rest on specimens, such as those of Bourgeau, with outdated or vague geographical documentation. A listing by Russell 1937, 1944 was merely speculative. An Alberta report by Rydberg 1932 has not been investigated.

4. L. ludoviciana (Nutt.) Riddell -- Like the last, but the leaves spinulose dorsally along the midnerve and

the heads longer. Inflorescence an open panicle. Involucre 15-23 mm high. Mid summer. In the shrubby zone around bluffs. --(O-Man)-seS, US.

5. L. tatarica (L.) C.A. Meyer var. heterophylla (Nutt.) Boivin (var. pulchella (Pursh) Breitung; L. pulchella (Pursh) DC.) -- Blue Lettuce -- Especially conspicuous along roadsides, a virgate herb with large blue heads of ligulate flowers. Leaves narrowly lanceolate, entire, or the lower remotely lobed. Heads 2-3 cm wide. Mid summer. Scattered on the prairie, becoming conspicuous when the soil is disturbed. --seK-Mack-(Y)-Aka, Q-BC, US.

Stat. n., Mulgedium heterophyllum Nutt., Trans. Am. Phil. Soc. 2, 7: 441. 1841; Lactuca pulchella (Pursh) D.C. var. heterophylla (Nutt.) Farw., Ann. Rep. Mich. Ac. Sc. 6: 214. 1904. The latter combination establishes the priority of heterophylla at varietal rank.

Our plant is weakly differentiated from the siberian var. tatarica in which the leaves bear smaller, more remote and somewhat spinulose teeth.

A white-flowered form is known from Minnesota and probably occurs in our area, merely awaiting a sharp-eyed collector. It may be designated as f. Stevensii f.n., floribus albis. Typus: O.A. Stevens 2514, Felton, Minn. Aug. 10, 1961 (DAO).

6. L. floridana (L.) Gaertner -- Resembles L. canadensis, but the inflorescence is more open and the achene is beakless, the pappus sessile. Leaves pinnatifid to pinnatipartite, the terminal lobe broadly deltoid. Flowers blue. Mid summer. Edge of woods, rare: Otterburne.--sO-seMan, US.

7. L. biennis (Moench) Fern. (L. spicata AA.) -- Pappus tinted grayish to pale brown, otherwise similar to L. canadensis. Main leaves pinnatipartite, the upper ones narrow, entire auriculate-clasping at base. Involucre \pm 1 cm high. Mid to late summer. Low and wet places. --(Aka), L-NF-(SPM), NS-BC, (US).

Closely related to L. floridana and perhaps only vari-
etally distinct.

68. LYCODESMIA D. Don

Ligules pink, the heads very narrow and containing only about 5 florets. Achene tapered at beak. Pappus of smooth bristles. Tegules dimegueth, the outer ones many times shorter.

a. Perennial; involucre 1.0-1.5 cm high .. 1. L. juncea
aa. Annual; involucre 1.5-2.0 cm high 2. L. rostrata

1. L. juncea (Pursh) D. Don -- Skeleton-Weed -- A skeleton weed with pink ligules. Rhizomes deeply buried. Very branchy from near the base. Branches longitudinally

striate. Leaves many but narrow, small and appressed, not very conspicuous and mostly shorter than the internodes. Heads terminal, solitary. Mid summer. A common prairie and steppe species. --sMan-sBC, US.

2. L. rostrata Gray -- Leaves and heads longer than the last. Blending in its surroundings and very hard to see. Leaves very narrow and very long, 2-6 times longer than the internodes. Branching mainly near the top. Heads terminal and axillary. Late summer. Bare or semi-bare sands, mainly in blowouts. --swMan-sAlta, cUS.

69. AGOSERIS Raf.

A basic type, scapose with monocephalous scapes and a pappus of non-plumose bristles on a beaked achene. Bristles minutely scabrous. Tegules imbricated. Resembles Taraxacum, but the achene is not acicular-muricate towards the top.

a. Beak 2-4 times as long as the body of the achene; tegules strongly dimorphic..... 3. A. grandiflora
aa. Beak shorter; outer tegules shorter, but otherwise similar to the inner.

b. Achene with beak half as long as the body or less; ligules yellow, drying yellow..1. A. glauca
bb. Beak longer; ligules deep orange, often drying purplish 2. A. aurantiaca

1. A. glauca (Pursh) raf. var. glauca (var. agrestis (Osterh.) Q. Jones, var. dasycephala AA., var. parviflora (Nutt.) Rydb.; A. agrestis Osterh.; A. parviflora (Nutt.) Dietr.; A. scorzonrifolia AA.; A. turbinata Rydb.) -- A native resembling the common, weedy Dandelions, but the leaves entire to narrowly lobed and the tegules not squarrose. Also resembles Microseris, but the latter has tomentose-ciliate leaves. Herbage entirely glabrous or quite often tomentose towards the summit of the scape and on the involucre, more rarely pilose on the stem and/or the leaves irregularly retrorse-ciliate towards the base, but glabrous on both faces, yet the midnerve sometimes pilose. Early to mid summer. Common in prairies. --O-BC, US--Var. dasycephala (T.& G.) Jepson (A. scorzonrifolia (Schrader) Greene -- Herbage pubescent throughout, becoming lanate on the involucre and towards the summit of the stem. Leaves pubescent on both faces, at least towards the edges. -- Cypress Hills, Grande-Prairie and Rockies. --Mack, Alta-BC, US.

A range extension to Yukon by Anderson 1949, repeated by Hultén 1950, queried by Boivin 1967, was based on a British Columbia collection from mile 611 along the Alaska Highway. See under Aster conspicuus above.

2. A. aurantiaca (Hooker) Greene var. aurantiaca -- Closely similar to the first, the top of the peduncle den-

sely lanate. Beak of the achene thin, up to twice as long as the body. Leaves more commonly dentate to remotely lobed. Mid summer. Alpine and sub-alpine prairies. --Mack-Y-(Aka), Q, swAlta-BC, wUS.

In a more southern var. purpurea (Gray) Cronq. the tegules are larger, more strongly imbricated and purple-spotted.

3. A. grandiflora (Nutt.) Greene -- Herbage lightly villous below to more densely so above, sometimes glabrescent. Leaves entire to more commonly pinnatifid. Outer tegules rhomboid-ovate, acuminate, broader than the inner. Ligules yellow, drying yellow or sometimes purplish. Early summer. Lowland meadows. Lake Saskatoon. --wcAlta-swBC, wUS.

70. CREPIS L.

Much resembling Agoseris, but with the stem more or less leafy and the inflorescence of more than one head. Achene beakless or short-beaked.

- a. Annual or biennial weed.
 - b. Leaves mostly cauline 5. C. tectorum
 - bb. Rosette leaves more numerous ... 6. C. capillaris
- aa. Perennial natives with a strong taproot; leaves mostly in a basal rosette.
 - c. Depressed and nearly stemless plant with the basal leaves overtopping the heads 2. C. nana
 - cc. Stem well developed and the heads much overtopping the foliage.
 - d. Glabrous; stem branchy and leafy throughout 1. C. elegans
 - dd. At least the rosette tomentose or hirsute; stem leaves, bracts and heads mostly borne in the upper third of the plant.
 - e. Plant glabrous above, the rosette coarsely hirsute 3. C. runcinata
 - ee. Herbage lightly to densely tomentose throughout 4. C. occidentalis
- 1. C. elegans Hooker -- Glabrous throughout, somewhat glaucous and slightly fleshy. Tufted and very branchy, 1-2 dm high. Lower and basal leaves petiolate, lanceolate, entire or nearly so, the upper linear and sessile. Heads numerous, 6-8 mm high. Summer. Gravel flats of braided glacial streams. --Mack-Aka, wAlta-eBC, (nwUS).
- 2. C. nana Rich. var. nana (ssp. ramosa Babcock) -- Like a dwarf version of the last, the stem so short that the basal leaves usually overtop the inflorescence. Taproot long and thick, rather large in relation to the aboveground parts. Involucre dark green, 9-13 mm high.

Mid summer. Alpine shale slides. --F-(K)-Mack-Aka, L-NF, swAlta-BC, wUS, (eEur).

Occasional specimens have a more elongated stem (=var. elongata). These are readily distinguished from C. elegans by the size of the heads.

In the alaskan and east-asiatic var. lyratifolia (Turcz.) Hultén the leaves are ± pinnatifid.

3. C. runcinata (James) T. & G. var. runcinata (C. glauccella Rydb., C. perplexans Rydb.) -- Very much like a Taraxacum, the leaves ± runcinate and all basal, but the stem bearing more than one head and bracteolate in the inflorescence. Rosette leaves sometimes entire, coarsely hispid, not glandular. Tegules glandular-hispid, the glands yellow; sometimes also finely puberulent. Early to mid summer. Common in wet places; alkali tolerant. --sMan-BC, US -- Var. glauca (Nuttall) Boivin (C. glauca (Nutt.) T. & G.) -- Involucre not glandular, merely finely puberulent, or more commonly glabrous. Mainly on alkaline prairies and shores of playas. --(sMan)-S-Alta, US -- Var. hispidulosa Howell (C. platyphylla Greene) -- Larger and the leaves usually glandular along the midnerve. Pubescence otherwise as in var. runcinata. Leaves ovate to lanceolate, usually larger, 1 dm long or more, 4 cm wide or more. Heads numerous, usually more than 10. Grassy highlands: Cypress, Waterton. --swS-Alta, wUS.

The range had been extended eastward to Timmins, Ontario, in Nat. Mus. Can. Bull. 156: 246, 1958, but the justifying collection (MT, TRT) has since been revised to Leontodon autumnalis L. var. pratensis (Link) W.D.J. Koch.

4. C. occidentalis Nutt. var. occidentalis (var. costata Gray; C. atribarba Heller; C. intermedia Gray) -- Leaves deeply lobed, pinnatifid to pinnatipartite, the lobes triangular to filiform and entire to dentate. Inflorescence corymbose. Heads few to many, usually grayish-tomentose, commonly 1.0-1.5 cm high, bearded with thick, black hairs about 0.5 mm long. Early summer. Montane prairies and Milk River Valley. --swS-SBC, US.

More western plants in which the involucre is devoid of thick black hairs are distinguished as var. cytotaxonomicorum (Boivin) stat. n., C. atribarba Heller var. cytotaxonomicorum Boivin, Nat. Can. 87: 31. 1960 (and ultimately ssp. originalis Babc. & Stebb.)

This species varies within unusually broad limits; the more obvious phenotypic variant has the leaves pectinately dissected into remote, narrow and usually entire segments; it has been called C. atribarba, but it is not discretely separable from the run-of-the-mill C. occidentalis and the rank of variety (i.e. var. gracilis D.C. Eaton) would be more realistic. We have not given it recognition at any rank because, at least in the canadian part of its range, it seems to present itself as an ex-

treme of variation of sporadic occurrence.

Canadian reports of C. acuminata Nutt. and C. angustata Rydb. were based, at least in part, on specimens of var. cytotaxonomicorum. This remark may possibly apply also to some of the earlier reports of C. intermedia discussed below.

C. modocensis Greene, a more southern species, appears to grade into C. occidentalis on the one hand and also into the more southern C. acuminata Nutt. on the other. Neither C. modocensis var. C. acuminata are known in Canada, but intermediates to C. occidentalis do occur. It is customary to use C. intermedia Gray to designate such intermediate specimens. We are not too clear as to their significance; they do not appear to be hybrids, yet we are not able at present to offer a classification that would reflect taxonomically and account realistically for the existence of such extraneously related intermediates in our flora. Over a period of years we have tried now to consolidate the members of this series into a single species (C. occidentalis), now to treat them as so many species, but we have not been able to achieve a satisfactory treatment either way.

5. C. TECTORUM L. -- Tegules pubescent on both faces, being strigose on the inner. Annual (or biennial) and very variable. Stem simple, becoming very branchy. Rosette leaves evanescent, being usually wilted by flowering time. Stem leaves numerous, lanceolate to long linear or filiform, entire to pinnatifid. Involucre 7-9 mm high, tomentose and glandular-pubescent. Seeds 2.5-4.5 mm long, with a short thin beak and a white pappus. Summer. Common weed of roadsides, railways, etc. --G, sMack-Y, (NF, NS)-PEI-BC, US, Eur, (Oc).

6. C. CAPILLARIS (L.) Wallr. -- Somewhat like the last but biennial and retaining its abundant rosette all summer. Branchy and often many-stemmed, the lowermost internode(s) usually quite short. Stem leaves mostly subtending branches and smaller than the rosette leaves, the latter mostly 1-2 dm long. Tegules pubescent on the outer face only, or glabrous on both faces. Heads small, the involucre only 5-8 mm high. Seeds beakless and only 1.5-2.5 mm long. (Late summer?). Rare weed of drier and open places: Calgary.--NS, NB-O, swAlta-BC, US, (SA), Eur, (Oc).

Our only collection (MTMG) is undated. It was made by M.E. Moodie about half a century ago.

71. PRENANTHES L. RATTLESNAKE-ROOT

A middling type with a leafy stem and beakless seeds bearing a white and smooth pappus. But the flowers are nearly white or pale pink and the inflorescence is race-

mose or paniculate. Habitally often similar to Lactuca, but the seeds not flattened.

a. Inflorescence abundantly hirsute 1. P. racemosa
aa. Glabrous.

b. Tegules green; pappus lightly tinged ...
..... 2. P. sagittata

bb. Tegules purple; pappus chestnut brown ..
..... 3. P. alba

1. P. racemosa Mx. (Nabalus racemosus (Mx.) DC.) -- Copiously hirsute in the inflorescence, glabrous and glaucous below. Lower leaves oblanceolate, petiolate, the upper ones much smaller, sessile and cordate-clasping. Involucre purple. Ligule pink to nearly white. Pappus yellow. Late summer. Wet prairies, infrequent. -- (seK), NF, NS, NB-neBC, US.

2. P. sagittata (Gray) Nelson -- Leaves sagittate, remotely dentate, the upper successively rhomboid then lanceolate. Lower leaves often opposite. Petiole winged. Inflorescence narrow. Ligules white. Pappus straw-coloured. Mid summer. Mountain woods: Rockies and Swan Hills. -- Alta, (nwUS).

3. P. alba L. (Nabalus albus (L.) Hooker) -- Rattlesnake-Root -- Main leaves deltoid, remotely dentate to deeply lobed. Lower petioles not winged. Pedicels very short. Ligules white. Pappus deep brown. Second half of summer. Low woods. -- Q-cS, (US).

72. HIERACIUM L.

HAWKWEED

Like Prenanthes, but the flowers typically yellow and the inflorescence commonly umbellate.

a. Leaves mostly basal.

b. Leaves glabrous or nearly so 3. H. triste

bb. Copiously long hirsute.

c. Flowers orange-red 1. H. aurantiacum

cc. White 5. H. albiflorum

aa. Leaves all or mostly borne on the stem.

d. Leaves fairly uniformly distributed on the stem, the lower ones wilted or deciduous by flowering time 2. H. umbellatum

dd. Leaves borne mostly in the lower third of the stem, the others few and much smaller ...
..... 4. H. cynoglossoides

1. H. AURANTIACUM L. -- Devil's Paint-Brush, King-Devil (Marguerite rouge, Saint-Louis) -- Heads red-orange, tending to dry deep red. Herbage copiously very long hirsute throughout and more or less purplish. Involucre densely pubescent with a mixture of long hirsute hairs, shorter glandular ones and very small stellate hairs. Mid summer. Rare and recent roadside introduction. -- NF-

(SPM), NS-O, Alta-BC, US, Eur.

Has been repeatedly reported for Manitoba by Lowe 1943, Frankton 1955, 1970, Scoggan 1957, Budd 1957 and 1964, Best 1964, and Boivin 1966 on the basis of a Winnipeg collection. Yet in 1966 no such collection could be located at WIN or elsewhere and we are now speculating that, if any specimen ever existed, it may have been revised to some other taxon.

2. H. umbellatum L. (var. canadense (Mx.) Breitung; H. canadense Mx.; H. columbianum Rydb.; H. scabriusculum Schwein.) --(Accipitrine) -- Leaves typically remotely dentate. Pubescence variable. No basal rosette and the lower leaves early deciduous. Leaves broadest below the middle. Heads often subumbellate. Mid and late summer. --Mack-(Y-Aka), L-NF-(SPM), NS-Alta-(BC), US, Eur.

A somewhat variable species, found on both sides of the Atlantic. Mainly on the basis of pubescence variability, the Canadian material has been subdivided into about 20 taxa. In Europe, where the genus is dealt with on the basis of national monographs, this species has been further subdivided into a host of microspecies.

3. H. triste W. var. gracile (Hooker) Gray--Smallest and green below, but conspicuously black-pubescent in the inflorescence. Commonly less than 3 dm high. Herbage glabrous or nearly so below, becoming densely long pubescent in black in the inflorescence, the pubescence mixed with much shorter and partly glandular hairs. Younger plants are sometimes finely pubescent to the base. Leaves less than 1 dm long, oblanceolate, rounded at tip. Involucre 6-8 mm high. Mid summer. Meadows towards timberline. --Mack-Aka, wAlta-BC, wUS, (SA).

In the more western typical phase the longer hairs reach 2-4-(5) mm and are usually not glandular. In our variety they are only 0.5-1.5 mm long and often partly glandular.

4. H. cynoglossoides A.-T. (H. albertinum Farr; H. Rydbergii Zahn; H. Scouleri AA.) -- General habit of H. aurantiacum and H. albiflorum, but the ligules yellow and the leaves mostly borne towards the base of the stem. Leaves and lower part of plant densely long-hirsute, the upper part variously hirsute or glandular or stellate-pubescent. Larger leaves mostly 1-2 dm long. Involucre mostly 8-10 mm high. Mid summer. Montane prairies and light woods; Cypress and Rockies. --Alta-sBC, nwUS.

H. Scouleri is listed by Porsild 1959 for the Rockies, but all specimens so named at CAN, GH and V have been revised to H. cynoglossoides.

5. H. albiflorum Hooker -- Ligules white and the herbage devoid of stellate pubescence. Otherwise quite

similar to H. aurantiacum but the long hairs very dense towards the base, becoming very sparse in the inflorescence. First half of summer. Lodgepole forests. -- (Y)-Aka, (seMan)-swS-BC, wUS.

ADDITIONS AND CORRECTIONS

The following information became available only after the corresponding text had been given its final form for printing.

Page 9 -- Cuscuta Gronovii W. -- It must be recognized that the U.S. material at hand is much more variable than ours. Some of the U.S. specimens examined do have much longer and lanceolate corolla lobes, other specimens do have much smaller capsules loosely enclosed by the marcescent corolla, etc. Therefore we are not precluding that some of the distinctions rejected for our Canadian material could be applicable and pertinent to more southern populations.

Page 15 -- Penstemon albidus Nutt. -- Dawson's 1875 report of P. glaucus Graham from the Second Crossing of the Souris River (DAO) was ignored by Macoun 1884, but referred to P. gracilis by Scoggan 1957. It proved to be based on a specimen of P. albidus.

Page 17 -- Penstemon gracilis Nutt. -- The stem is minutely retrorse-puberulent, at least towards the base.

Page 19 -- Limosella -- The leaf width is not a fully reliable distinction between L. aquatica and L. subulata, but these may be further contrasted as follows:

L. aquatica L. -- Stoloniferous, the stolons green, superficial, and usually present in the herbarium. Flower 1.0-2.0 -(2.5) mm long, the corolla only slightly (or not at all) exerted; typically only the lobes are exerted. Ripening capsule with a white line along the suture, eventually opening by two valves, these finely pencil-margined in white.

The last character is transposed in Fernald 1950.

L. subulata Ives -- Stolons thinner, white, slightly buried, fragile and usually absent in the herbarium. Flower larger, 2.5-4.0 mm long, the corolla being 1½ times the length of the calyx; typically the corolla lobes are fully exerted along with part of the tube. Capsule not lined in white, rupturing irregularly at maturity.

The reports of L. subulata for our area by Boivin 1967 and above are to be discounted as they were based on collections from Granum and Ponoka (both DAO) with filiform leaves but with the smaller flowers, etc., of L. aquatica and they have been revised accordingly. Reports from Alberni, B.C. and Keewatin are also to be referred to L. aquatica on similar grounds. L. subulata is then apparently restricted in its distribution to the tidal shores of the east coast of North America.

Page 20 -- Veronica longifolia L. -- Mostly 5-10 dm high. Leaves all opposite, or the uppermost often alternate or verticillate. Calyx green, much less densely puberulent than the rest of the inflorescence, the lobes finely ciliate and lightly puberulent on back. Style 7-9 mm long after the fall of the corolla.

The above criteria will bring out the differences with V. spicata.

Page 20 -- Add the following species:

1a. VERONICA SPICATA L. -- (Perse brunette) -- Quite similar to V. longifolia but generally smaller, mostly 2-4 dm high. More densely puberulent, becoming grayish in the inflorescence. All leaves opposite. Calyx as densely puberulent as the rest of the inflorescence and \pm grayish. Style 4-6 mm long after the fall of the corolla. Infrequent ornamental, rarely spreading to roadsides; Lacombe. --Q, Alta, (US), Eur.

Page 23 -- Agalinis purpurea and its variety parviflora should be eliminated from our area.

First reported by Hooker 1838 as Gerardia purpurea from Saskatchewan where collected by Drummond. This was repeated by many later authors, but the use of Saskatchewan in Hooker does not coincide with the modern meaning of Saskatchewan as a province. Reports in the latter sense were justifiably discounted by Breitung 1957. Indeed the label of Drummond's specimen merely reads "Norway House to Canada" (K). Pennell 1935 studied this sheet, and cited it under Gerardia paupercula borealis as coming from "Manitoba (?)". However Drummond's geographical data was essentially vague and in the absence of a later confirmation it seems unwarranted to assume that his specimen was actually collected in Manitoba rather than further to the east.

A report from Morden by Lowe 1943 was discounted by Scoggan 1957 as being based on a specimen of G. aspera. Similarly the collection Garton 3537, Stony Mountain (DAO) cited by Scoggan 1957 as G. paupercula has since been revised to Agalinis aspera. A Dawson collection from Lake of the Woods (MTMG) was listed by Dawson 1875 as G. purpurea and by Scoggan 1957 as G. paupercula. It belongs with A. tenuifolia var. parviflora as do all collections studied from the southeastern part of the province.

Thus we are left without any unquestioned voucher to the presence of A. purpurea (or G. paupercula) in Manitoba.

Page 24 -- Agalinis tenuifolia (Vahl) Raf. -- Axillary fascicles are usually present in our var. parviflora

(Nutt.) Pennell, and the capsule is 5-7 long. In the more eastern and less boreal typical phase, var. tenuifolia, axillary fascicles are usually lacking, the calyx lobes do not exceed 1 mm, and the smaller capsule is only 3-5 mm long.

Page 25 -- Castilleja lutescens (Greerman) Rydb. -- Also in Waterton and the Pincher Creek areas. Older Alberta reports of C. pallida var. septentrionalis by Macoun 1884 and others were primarily based on specimens of C. occidentalis, but the Dawson collection seems closer to C. lutescens.

Page 29 -- Pedicularis flammea L. -- Add: P. flavescens Pol. -- Corolla monochrome in yellow. Cadomin. -- (nQ)-nO, swAlta.

Page 29 -- Pedicularis Oederi var. albertae is to be versed into the synonymy of P. flammea of which it is only a more abundantly villous extreme.

The difference in pubescence between P. flammea and P. Oederi is not sharply marked, despite some keys, including ours above.

On the basis of the more abundant material now at hand, the variation in pubescence runs as follows:

P. Oederi. Herbage more or less villous throughout or at least in the inflorescence. But sometimes the herbage is completely glabrous except for the ciliate bracts and calyx lobes.

P. flammea is typically glabrous except for the ciliate bracts and calyx lobes. Varies to completely glabrous and eciliate, or again to more or less villous in the inflorescence.

The two species are obviously close to each other, yet quite distinct, and may be contrasted as follows:

P. Oederi. Usually 1-2 dm high in flower, elongating to 2-3 dm in fruit. Flowers larger by half, (16)-20-(25) mm long. Calyx 8-11 mm long, its lobes \pm dilated and \pm toothed at tip. Corolla exserted from the calyx by \pm 1 cm. Galea 2-3 mm wide and tinged or spotted in red towards the tip. Lower corolla lobes spreading \pm horizontally. Style exserted by (0.1)-0.5-1.0-(2.0) mm.

P. flammea is generally a smaller plant with smaller and more deeply coloured flowers. Usually less than 1 dm high at flowering, elongating to 2 dm in fruit. Flower (11)-14-(16) mm long. Calyx 6-9 mm long. Corolla exserted by 5-7 mm. Galea 1.5-2.0 mm wide, deep red for about half of its length. Lower corolla lobes divergent by 30-45°. Style not protruding from the hood

of the galea.

Page 33 -- Orobanche fasciculata Nutt. -- The range extension to Ontario is based on a single plant recently collected at La Cloche Island (OAC). For Anaplanthus read Anoplanthus.

Page 33 -- Orobanche uniflora L. -- On the basis of the length and shape of the calyx lobe this species is divisible into a pair of geographical variants as follows:

Var. uniflora -- Calyx lobes less than twice as long as the tube, gradually narrowed into an attenuate tip which is shorter than the main triangular portion of the lobe. Cypress Hills. --(Y)-Aka, NS-(PEI)-NB-O, swS, US.

Var. minuta (Suksd.) Beck -- Calyx lobes longer and more abruptly narrowed, at least twice as long as the tube, the main portion of the lobe tending to be deltoid and shorter than the caudate tip. Waterton. --soAlta-BC, wUS.

More than 90% of the specimens will conform well to the above criteria relative to their geographical origin, but quite a few are transitional and the odd one (ignored for the purpose of the above ranges) will be completely atypical.

A further subdivision of the western phase is sometimes attempted in which var. minuta (=var. Sedi (Suksd.) Achey) is restricted to the smaller-flowered plants, while var. purpurea (Heller) Achey denotes the rather showy larger-flowered plants. Both varieties appear to have the same range; the rank of form would probably be more appropriate, if the distinction is deemed desirable.

Page 38 -- Geranium pratense L. var. erianthum (DC.) Boivin -- The flowers are typically bluish-mauve, but a white-flowered mutant is known: f. leucanthum f. n., petalis albis. Typus: W.B. Schofield 2489, Alaska, Cold Bay, flowers white, rare among typically blue-flowered plants on sheltered tundra slope, July 28, 1952 (DAO). Still known from a single alaskan collection, but expected to be sporadic throughout the range of the species.

Page 56 -- Mertensia lanceolata (Pursh) A. DC. var. lanceolata -- Our plant grows in closed tufts and its stems bear (8)-10-(15) leaves. It is barely distinct from the rare arctic var. Drummondii (Lehm.) stat. n., Lithospermum Drummondii Lehman, Nov. Stirp. Pug. 2: 26. 1828; Mertensia Drummondii (Lehm.) G. Don. The latter is more loosely tufted, the caudex branches more or less elongated and abundantly clothed with stubs of old petioles, the stem leaves only 5-8-(10) to a stem. No con-

sistent difference could be detected in the floral parts.

Page 70 -- An undetermined species of Mentha has been recorded as persisting in a long abandoned garden at Glenevis (Pegg 1213, DAO). By its ovate leaves, its long and dense pilosity, etc. it resembles M. rotundifolia (L.) Hudson, a species known to persist occasionally in southern Ontario. However, our plant differs in a number of respects: its pubescence is longer in the inflorescence, its spikes are leafy-bracted, the bracts being large, its calyx is somewhat longer with longer pubescence, etc.; we have yet to find a satisfactory name for it.

Page 70 -- For Elscholtzia read Elsholtzia.

Page 210 -- Agoseris glauca (Pursh) Raf. -- The herbage will vary from completely glabrous to ± lanate on the involucre and at the summit of the stem. The pubescent phase has been commonly identified and reported upon as var. dasycephala or as A. scorzonrifolia. But both forms are generally common, they have been reported throughout our area and do not appear to be taxonomically significant. If however var. dasycephala be defined in a somewhat more restrictive manner, as we have done above, it does become a geographically restricted variety.

Because of our more restrictive definition of var. dasycephala, it seems preferable to discount all previous reports except such as were checked and conformed to our criteria. All Manitoba sheets examined, including Marshall's from Brandon (DAO), belonged to var. glauca. Earlier Saskatchewan reports of A. scorzonrifolia were discounted by Breitung 1957 and all specimens examined, including Breitung 4442 (DAO), were placed with var. glauca. Similarly most Alberta specimens were referred to var. glauca. But all Mackenzie sheets examined were closer to var. dasycephala.

The leaves vary from entire to dentate, or more rarely pinnatifid with the lobes narrow and somewhat remote. The last phenotype (=var. agrestis) seems to occur throughout our range and accordingly it has been submerged into the typical phase.

Page 215 -- Hieracium triste W. var. triste -- Now known to our area on the basis of the following: G. Scotter 16857 & 16950, Tonquin Valley, Jasper Park, 1971 (DAO). The general range: swMack-Aka, swAlta-BC, wUS (Wyoming), (eBur).

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A NEW VARIETY OF POIRETIA LATIFOLIA

AND A BRIEF RESUME OF THE GENUS POIRETIA VENT. (LEGUMINOSAE)

Velva E. Rudd, Smithsonian Institution

Among recent collections made in Brazil by H. S. Irwin, et al. is a unifoliolate Poiretia. Other known taxa of the genus are 3- or 4-foliolate. The new taxon appears to be a variety of P. latifolia Vog. and is described below.

The faboid genus Poiretia Vent., with its lomentaceous fruit, is included in the tribe Hedysareae DC., Prodr. 2: 307-353. 1825, subtribe Poiretiinae Burkart, Darwiniana 3: 125. 1939.

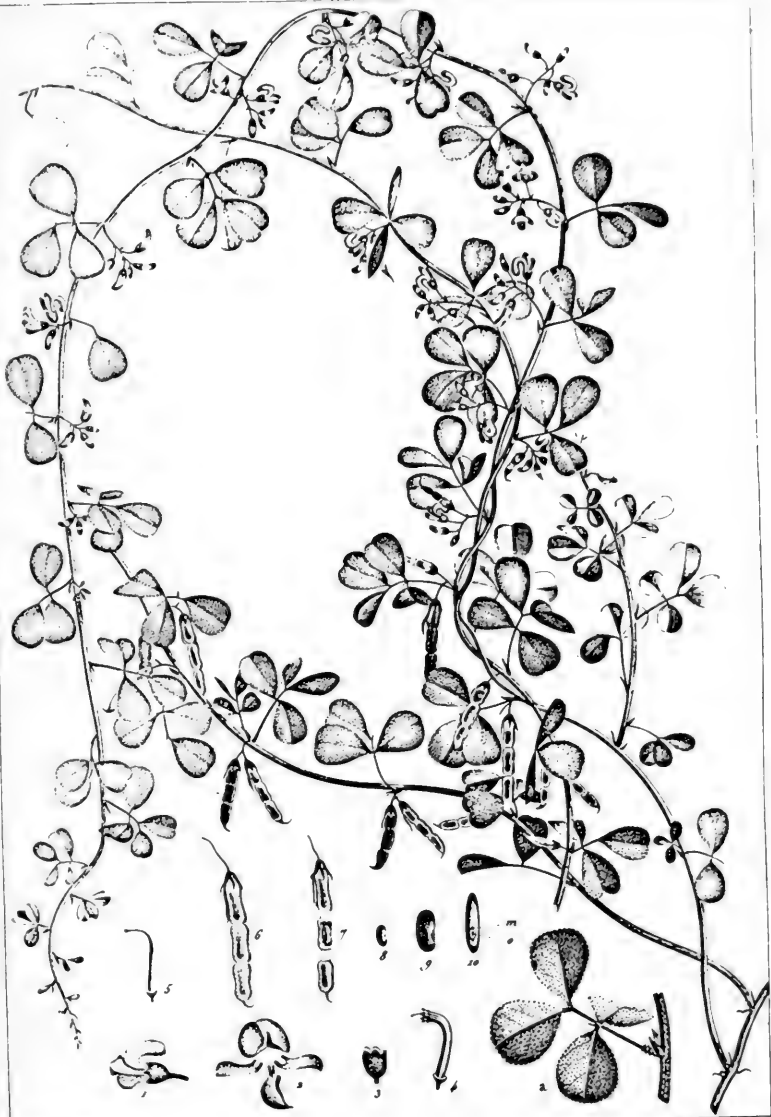
POIRETIA Vent. Mém. Cl. Sc. Math.-Phys. Inst. Nat. France 1807(1): 4. July 1807, nom. cons., non J. F. Gmelin 1791, nec Cav. 1797, nec J. E. Smith 1808.

Turpinia Pers. Syn. Pl. 2: 314. Sept. 1807, nom. rej., non Humb. & Bonpl. Apr. 1807 ('1808'), nec Vent. Jul. 1807, nec Raf. 1808, nec Lex. 1824.

Plants herbaceous or suffrutescent, erect or scandent, to about 3-4 m. high; stipules lanceolate, usually glandular, caducous; stipels present at base of lower pair of leaflets, linear to lanceolate or ovate, usually glandular, caducous; leaves 1-, 3-, or 4-foliolate; leaflets chartaceous to coriaceous, linear to ovate, obovate, or suborbicular, glandular-punctate below, the glands sometimes visible above; inflorescences axillary or terminal, racemose, sometimes paniculate or spicate, few- or many-flowered; bracts stipule-like; bracteoles lacking; flowers small to moderate in size, 4-20 mm. long; calyx glandular-punctate, campanulate with 5 subequal lobes shorter than the tube, the vexillar lobes smaller than the others and somewhat connate; petals yellow, glandular-punctate, the vexillum reflexed, glabrous or nearly so; stamens 10, monadelphous, the anthers dimorphic, alternately oblong and basifixed or elliptic and dorsifixed; ovary sessile, 5-8-ovulate, glabrous or pubescent, the stigma terminal, minutely capitate; fruit sessile, oblong, laterally compressed, 1-8-articulate, glandular-punctate, sometimes verruculose; seeds brown, reniform, compressed, the hilum elliptic, lateral.

Type species: Poiretia scandens Vent., a synonym of P. punctata (Willd.) Desv.

- Plants scandent; flowers 4-8 mm. long in axillary racemes; fruit about 3 mm. wide; leaves 4-foliolate, the leaflets obovate with margin often glandular but not completely hyaline. Flowers 4-5 mm. long; calyx, fruit, and leaflets glabrous or rarely pubescent. Mexico, West Indies, South America to Peru and Brazil. 1. P. punctata.
 Flowers 6-8 mm. long; calyx, fruit, and leaflets pubescent or the leaflets rarely glabrous. Brazil. 2. P. pubescens.
 Plants usually erect; flowers 6-20 mm. long in axillary or terminal racemes or panicles; fruit 5-6 mm. wide; leaves 1, 3-, or 4-foliolate, the leaflets linear to ovate, obovate, or suborbicular, the margin sometimes hyaline. Flowers 6-8 mm. long; margin of leaflets not obviously hyaline. Leaflets 3 or 4, linear to lanceolate or oblanceolate. Leaves 4-foliolate; leaflets linear to linear-ob lanceolate; flowers about 6 mm. long in axillary racemes. Brazil. 3. P. angustifolia.
 Leaves 3-foliolate; leaflets linear-lanceolate to lanceolate or lanceolate-oblong; flowers about 7 mm. long in terminal panicles. Brazil. 4. P. longipes.
 Leaflets 4, obovate to elliptic or suborbicular; Brazil, Uruguay, Argentina. 5. P. tetraphylla.
 Flowers 10-20 mm. long; margin of leaflets glandular and usually hyaline. Leaflets 4, ovate-elliptic, rounded at the apex and base. Brazil, Paraguay. 6a. P. latifolia var. latifolia.
 Leaflets 1 or 3, ovate or elliptic, cordate or acute at the base or sometimes rounded. Leaves 3-foliolate; leaflets usually ovate, sometimes elliptic, the apex rounded or acute, the base cordate to rounded. Brazil. 6b. P. latifolia var. coriifolia.
 Leaves 1-foliolate; leaflets elliptic, acute at apex and base. Brazil. 6c. P. latifolia var. unifoliolata.
1. POIRETIA PUNCTATA (Willd.) Desv. Journ. Bot. Agric. 1: 122, tab. 5, fig. 17. 1813; Mém. Soc. Linn. Paris 4: 308. 1826. Glycine punctata Willd. Sp. Pl. 3: 1066. 1802. Type: Poiteau, Haiti (B herb. Willd. n^o. 13469).
Poiretia scandens Vent. Mém. Cl. Sc. Math.-Phys. Inst. Nat. France 1807(1): 4. July 1807; Choix, tab. 42. Nov. 1807. Type: Turpin, "Domingo", "Saint-Dominique" (P).
Turpinia punctata (Willd.) Pers. Syn. Pl. 2: 314. Sept. 1807.
Poiretia densiflora Mart. Flora 20, beibl. 2: 124. 1837. Type: Martius, "in montibus apricis, saxosis, ad Rio de Janeiro, in prov. minarum passim," Minas Gerais, Brazil (BR).
Poiretia multiflora Mart. & Gal. Bull. Acad. Roy. Brux. 10(2): 179. 1843. Type: Galeottii 3270, "savanes de Zacuapan," Veracruz, Mexico (BR).
Poiretia refracta Griseb. Cat. Pl. Cuba 72. 1866. Type: C. Wright 2311, Oriente, Cuba (GOET ?).



[Ventenat, Choix de Plantes. Plate 42]

POIRETIA scandens.

Herbaceous or suffrutescent vine; stems to about 3 m. long, generally glabrous or puberulent; stipules linear-lanceolate, attenuate, 1-3 mm. long, 1 mm. wide; stipels linear-lanceolate, 1-2 mm. long, caducous; leaves 4-foliolate, the axis (0.5-) 1-4 (-6) cm. long; leaflets chartaceous, glabrous or nearly so, obovate, 5-50 mm. long and wide, obtuse, sometimes emarginate, the base acute, the margin not conspicuously hyaline; inflorescences axillary, racemose; flowers 4-5 mm. long; calyx glabrous or, in South America, sometimes puberulent, about 2 mm. long; fruit glabrous or rarely somewhat puberulent, 2-3 cm. long, 3 mm. wide, the articles 3-5 mm. long; seeds about 2.5-3 mm. long, 1-1.5 mm. wide.

Distribution: In wooded areas, usually climbing on shrubs, Mexico, Central America, eastern Cuba, Hispaniola, Colombia, Ecuador, Peru, Bolivia, Venezuela, Brazil.

Representative collections:

MEXICO: Sinaloa: Mazatlán, González Ortega 6396. Nayarit: Near Mazatán on road to Varas, Feddema 1053. Mexico: Temascaltepec, Matayac, Hinton 5142; Hinton 6751. Oaxaca: Río Cascabel, Mell 2227, 2286. Oaxaca ? or Veracruz ? : Consoquitla, Liebmann 4696. Veracruz: Zacuapan, Purpus 1879, 3046, 16215. Chiapas: Cascada, Matuda 1618. Montecrista, Matuda 1976. Mun. Venustiano Carranza, above Soyatitán, Ton 3140. GUATEMALA: Huehuetenango: near Jacaltenango, Nelson 3574. Jutiapa: Volcan Flores, Shannon 3677. Jalapa: Laguna de Ayarza, Heyde & Lux 4174. EL SALVADOR: San Salvador, Calderón 65; Standley 19190. Ahuachapán, Standley 19926; Padilla 567. HONDURAS: Morazán: San Antonio, Molina 735, 1159; Swallen 10925. Copán: Between Hacienda Grande and Ostuman, Molina 24762. COSTA RICA: San José: Alto de Santa Barbara, Pittier 1650. Escasú, Standley 32352. N of Santa Ana, A. Jiménez M. 1299. Alajuela: Alajuelita, Tonduz 9079. Panama: Cocle: Ola, Pittier 5082. CUBA: Oriente: Puntón de Cuero, N of Imías, Morton & Alain 8871. HAITI: Massif des Malheux, Thomazeau, Ekman H.1066. Massif de la Selle, Petionville, Fourcy, Ekman H.1140. Morne la Selle, Terre Froid, Holdridge 1806. Marmelade, Leonard 8431. St. Michel de l'Atalaye, Leonard 7176. Cabaret, Leonard & Leonard 11897. Port de Paix, Leonard & Leonard 1111. Jean Rabel, Leonard & Leonard 4313, 4572. Bombardopolis, Leonard & Leonard 13373. DOMINICAN REPUBLIC: Without exact locality, Wright, Parry, & Brummel 99. Santiago: Igua, J. Jiménez 1189. Monte Colorado near La Placeta, J. Jiménez 3818. San Juan: Piedra del Aguacate to Río del Oro, Howard & Howard 9395. Barahona: La Hotte, Howard 12266. COLOMBIA: Cundinamarca: Fusagasuga to Pandi, Pennell 2727. Cauca: Popayán, Lehmann 4752. Huila: Neiva, Marulanda Caicedo 4. VENEZUELA: Distrito Federal: Near Caracas, Pittier 7430, 7431. Between Antimano and Las Adjuntas, Pittier 12253. Río Macarac, Jahn 431. Between Baruta and Sabana Grande, Ll. Williams 10589. Between Caracas and La Guaira, Ll. Williams & Alston 34. Miranda: Las Mostazas, beyond Los Teques, Allart 195. Oripoto, Gines 4562. Carabobo: Valencia,

Pittier 8684. Bolívar: Between La Paragua and El Cristo, Killip 37617. ECUADOR: Barraganetal, Stevens 303. PERU: Cajamarca: Between Santa Cruz and Tamborapa, Lopez, Sagastegui, & Collantes 4122. BOLIVIA: Santa Cruz, Kuntze s. n., May 1892. BRAZIL: Pernambuco: Tapera, Pickel 3104. Caruarú, Lima 50-524. Bahia: Machado Portello, Rose & Russell 20008. Goiás: Between Posse and Alvorado, Irwin et al. 14956. Distrito Federal: Brasília, Pires et al. 9549. Minas Gerais: Lagoa Santa, Warming s. n. Belo Horizonte, Capoeirinha, Magalhães 3031. Paraopeba, Heringer [RB no.] 88225. Rio de Janeiro: "St. Salvador," Riedel 451.

2. POIRETIA PUBESCENS Vog. 12: 52. 1838.

Type: Sellow, "ad Rio Jan.", Brazil (B destroyed; Field Mus. Photo 2146 ex B; F fragment).

Herbaceous vine with stems to about 4 m. long, generally puberulent; stipules lanceolate, attenuate, 3-6 mm. long, 1-1.5 mm. wide; leaves 4-foliolate, the axis 2-5.5 cm. long; leaflets chartaceous, puberulent or rarely glabrous, obovate, 1-4 cm. long, 5-30 mm. wide, rounded at the apex, the base cuneate, the margin not hyaline; inflorescences axillary, racemose or spicate; flowers 6-8 mm. long; calyx puberulent, about 2 mm. long; fruit puberulent, 2-3 cm. long, 3 mm. wide, the articles 4-6 mm. long; seeds about 2.5-3 mm. long, 1 mm. wide.

Distribution: In wooded areas, climbing on shrubs, Brazil: Goiás, Minas Gerais, São Paulo.

BRAZIL: Goiás: Chapada dos Veadeiros, ca 5 km NE of Francisco Sá, road to Salinas, Irwin et al. 23194. Minas Gerais: Mun. Santa Luzia, Fazenda da Chicaca, Assis 118. Carandai, Quebra-Cambão, Duarte 654. Estrada dos Borges, near Belo Horizonte, Agronomic Institute, Irwin 2336. Serra do Espinhaço, ca 15 km N of São João da Chapada, Irwin et al., 28123. São Paulo: Ypanema, Riedel 2043.

3. POIRETIA ANGUSTIFOLIA Vog. Linnaea 12: 53. 1838.

Syntypes: Sellow, Minas Gerais, Brazil (B destroyed, Field Mus. Photo 2143 ex B); Manso & Lhotzky, Minas Gerais, Brazil.

Erect, suffrutescent herb, to about 70 dm. high, generally glabrous; stipules linear, attenuate, 5-7 mm. long, 0.5 mm. wide; stipels linear, minute, fugacious; leaves 4-foliolate, the axis 1-2 cm. long; leaflets chartaceous, glabrous, linear to linear-oblongate, 5-20 mm. long, 0.5-3 mm. wide, mucronulate, the base cuneate, the margins revolute; inflorescences axillary, few-flowered but in aggregate appearing spicate; flowers about 6 mm. long; calyx glabrous, about 2 mm. long; fruit glabrous, 2-3.5 cm. long, 5-6 mm. long, the articles about 5-6 mm. long; seeds about 2-2.5 mm. long, 1.5 mm. wide.

Distribution: In cerrado and margin of gallery woods, southeastern Brazil: Goiás to Paraná.

BRAZIL: Without exact locality: "Mugy," Riedel 1553. Distrito Federal: Brasília, Irwin et al. 11083. Goiás: Serra dos Pirineus, ca 15 km S of Corumbá, Irwin et al. 10811. Serra do Facão, ca 25 km NE of Catalão, Irwin et al. Minas Gerais: Lagoa Santa, Warming s. n. Uberava, Regnell III.422. Uberlândia, Macedo 948. Morro das Pedras, ca 26 km NE of Patrocínio, Irwin et al. 25573. São Paulo: São Paulo, Vila Morais, Handro 45309. Parara: Jaguaraiava: Ponta Grossa, Parque Vila Velha, Hatschbach 13106. "Rod. Jaguaraiava-Senges, Hatschbach 8654.

4. POIRETIA LONGIPES Harms, Fedde Repert. Sp. Nov. 9: 440. 1911.

Type: Peckolt, July 1911, São Paulo, Brazil (B destroyed; Field Mus. photo 2144 ex B; F fragment).

Poiretia longipetiolata Hoehne, Bol. Inst. Brasil. Sc. 2: 247, pl. 3. 1926. Type: Gehrt 4043, São Paulo, Brazil, "Pedregulho, interior do Estado" (SP ?).

Erect subshrub, generally glabrous; stipules and stipels not known; leaves 3-foliolate, the axis 3-12 mm. long; leaflets subcoriaceous, glabrous, linear-lanceolate to lanceolate or lanceolate-oblong, 7-15 mm. long, 1-2 mm. wide, mucronulate, the base cuneate; inflorescences terminal, paniculate and axillary, racemose; flowers about 7 mm. long; calyx glabrous, 2.5-3 mm. long; fruit glabrous, 1.5-2.5 cm. long, 3-4.5 mm. wide, the articles 5-8 mm. long.

Distribution: São Paulo, Brazil.

5. POIRETIA TETRAPHYLLA (Poir.) Burkart, Darwiniana 3: 224. 1939.

Psoralea tetraphylla Poir. in Lam. Encyc. Meth. Bot. suppl. 4: 589. 1816. Type: Commerson, Buenos Aires, Argentina (P).

Poiretia psoraloides DC. Prodr. 2: 315. 1825. Based on Psoralea tetraphylla Poir.

Erect, suffrutescent herb, to about 1 m. high, generally glabrous or subglabrous; stipules lanceolate, attenuate, 5-10 mm. long, 1 mm. wide; stipels about 2-4 mm. long, 0.5 mm. broad, attenuate, caducous; leaves 4-foliolate, the axis about 2-5 cm. long; leaflets chartaceous to subcoriaceous, glabrous, obovate to suborbicular, about 5-25 mm. long, 5-20 mm. wide, the apex and base usually rounded, the margin not conspicuously hyaline; inflorescences racemose, terminal or axillary; flowers 6-8 mm. long; calyx glabrous or subglabrous, 2-3 mm. long; fruit glabrous, 1-4 cm. long, 5-6 mm. wide, the articles about 5-7 mm. long; seeds 3 mm. long and 2 mm. broad.

Distribution: In cerrado, grassland and open woods, southeastern Brazil: Goiás, Minas Gerais; Uruguay; northeastern Argentina.

BRAZIL: Goiás: Serra dos Pirineus, 15 km N of Corumbá de Goiás on road to Niquelândia, Irwin et al. 1859⁴. Minas Gerais: "C. Verde," Macedo 653. Ituiutaba, Macedo 319⁴. Uberava, Regnell III. 423a. URUGUAY: Cerro Largo: Río Negro, Rosengurtt et al. A-782. Canelones: Atlántida, Rosengurtt B-2821. ARGENTINA: Chaco: Las Palmas, Joergensen 2138. Las Breñas, Venturi 974⁸. Santa Fe: Mocoví, Venturi 52. Corrientes: Empedrado, Río Paraná, Estancia "Las Tres Marias," Pedersen 3013. Concepción, Rincón de Luna, Pedersen 4483.

6. POIRETIA LATIFOLIA Vog. Linnaea 12: 54. 1838.

Plants usually erect, sometimes scandent, suffrutescent, to about 3 m. high, generally glabrous; stipules obliquely ovate to lanceolate, acute, 5-15 mm. long, 3-5 mm. wide; stipels 3-7 mm. long, 1-1.5 mm. wide; leaves 1-, 3-, or 4-foliolate, the axis 1-7 cm. long; leaflets coriaceous or subcoriaceous, glabrous, ovate to elliptic, about 1.5-7.5 cm. long, 1-5 cm. wide, acute or obtuse, the base acute, rounded to cordate, the margin usually densely glandular, hyaline; inflorescences commonly terminal, paniculate, but also axillary; bracts obliquely lanceolate-oblong about 2-10 mm. long, 1-2 mm. wide; fruit glabrous, 3-4 cm. long, 5-6 mm. wide, the articles 6-8 mm. long; seeds 2.5-3 mm. long and 2 mm. wide.

Distribution: In cerrado thickets, Brazil, Paraguay, Argentina.

6a. POIRETIA LATIFOLIA var. LATIFOLIA

Type: Sellow, Montevideo Uruguay (B destroyed).

The typical variety has 4-foliolate leaves, the leaflets ovate to elliptic, 1-5 cm. long, 1-3 cm. wide, rounded at the apex and base.

. Distribution: Brazil: Minas Gerais, Paraná, Santa Catarina; Paraguay.

BRAZIL: Minas Gerais: Serra do Espinhaço, ca 4 km N of São João da Chapada, Irwin et al. 28183. Paraná: Balsa Nova, Bugre, Hatschbach 9526. Palmas, São Agostinho, Hatschbach 15429. Santa Catarina: W of Curitibanos toward Campos Novos, Smith & Klein 8340. Chapecó, Fazenda Campo São Vicente, 24 km W of Campo Erê, Smith et al. 9352. Lajes, Estrada da Rodagem S of Lajes, Smith & Reitz 9972. Agua Doce, Fazenda Esperança, Campos de Palmas, Smith & Klein 13496. PARAGUAY: Tapytá, Joergensen 4550.

6b. POIRETIA LATIFOLIA var. CORIIFOLIA (Vog.) Benth. in Mart. Fl. Bras. 15(1): 79. 1859.

Poiretia coriifolia Vog. Linnaea 12: 55. 1838. Type: Sellow, "In Brasilia meridionali: Sellow leg. (in Montevideo?)", Uruguay or Brazil (B destroyed).

This variety is readily distinguished by its 3-foliolate leaves, the leaflets usually ovate, sometimes broadly elliptic, 2-7.5 cm. long, 2-5 cm. wide, rounded or acute at the apex, rounded or cordate at the base.

Distribution: Brazil: Goiás, Minas Gerais, Mato Grosso.

BRAZIL: Goiás: Chapada dos Veadeiros, Irwin et al. 12341, 24134, 24707. Serra dos Pirineus, 20 km NW of Corumbá de Goiás, Irwin et al. 19237. Distrito Federal: Córrego Paranoazinho, near Sobradinho, Irwin et al. 11500. Riberão Torto, ca 10 km NE of Brasília, Irwin et al. 13082. Mato Grosso: Serra do Roncador, ca 60 km N of Xavantina, Irwin et al. 16666. Upper Rio Araguaia, S of Xavantina Irwin et al. 16827, 17343. Minas Gerais: Sítio, Dorsett et al. 299b. "C. Verde," Macedo 634. Ituiutaba, Macedo 1614. Bento Pires near Belo Horizonte, Williams & Assis 5926, 6110. Diamantina, Pereira 1595; Irwin 2459. Ca 10 km SE of Paracatú, Irwin et al. 26234.

6c. POIRETIA LATIFOLIA var. UNIFOLIOLATA Rudd, var. nov.

Type: H. S. Irwin, R. H. Maxwell, D. C. Wasshausen 20431, Brazil, "western slopes, cerrado with exposed sandstone cliffs and outcrops, Serra do Cipó, Minas Gerais, ca. km. 112 (ca. 135 km. N. of Belo Horizonte), elev. 1200 m., 18 February 1968. Holotype US 2590985 A; isotype NY.

A varietate typica foliis unifoliolatis, foliolis ellipticis, apice basique acutis differt.

This variety is characterized by 1-foliolate leaves, the leaflets elliptic, 1.5-3 cm. long, and about 1 cm. wide, acute at the apex and base.

Distribution: Known only from the type collection.

The collections cited above are at US unless otherwise noted. Additional collections from South America were cited by Burkart in his treatment of the genus in Darwiniana 3: 222-228. 1939.

THE STATUS OF THE GENUS CRYPHIDIUM

(BRYOPHYTA: MUSCI)

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During recent studies of South American mosses, I have rather incidentally gathered information on the genus Cryphidium. I have seen material of a number of the species that have been placed in the genus, and the more recent transfer of most of these species to other genera has been noted. At this time I would complete the reduction of the genus.

Cryphidium was first established by Mitten (1869) as a section of Neckera with one species, N. leucocoleum Mitt., from Uruguay. The section with its single species was raised to generic rank by Jaeger (1877). The extension of the genus to include five Australian and Pacific Island species was the work of Brotherus in the first edition of Engler and Prantl (1905). A more proper alinement of these other species was indicated first by Fleischer (1914) and then summarized by Brotherus in the second edition of Engler and Prantl (1925).

In the Brotherus treatment of 1905, the concept of the genus was altered greatly by the addition of the Australian and Pacific species which had the capsules terminal on unspecialized branches. These latter species are now placed in a separate genus, Cyptodon, and the relationship is closer to Dendrocryphaea of Chile. Cyptodon and Dendrocryphaea come closest to each other geographically in Chile where C. crassinervis Broth. of Juan Fernandez has been mistaken for D. cuspidata (Sull.) Broth. of the Chilean mainland. The differences between these two species include the following, of which some are generic characteristics. Cyptodon crassinervis has a more acute leaf apex, lacks the minute papillae at the ends of the leaf cells, has a smoother abaxial surface on the costa, lacks the small area of slightly larger cells below the larger area of transversely elongate alar cells, and has a flatter rather than conical operculum.

There remains the question of the generic distinctions of Cryphidium as represented by the type species. In the recent treatment in Musgos Sul-Brasileiros II by Sehnem (1970), the genus is separated from Cryphaea by the portion of the Conspecto stating "arquegoniários terminais em ramos mais ou menos alongados" versus "Arquegoniários em ramos curtíssimos laterais". This incorrect characterisation of Cryphidium seems to be derived from the earlier work of Brotherus (1905).

Examination of recent material collected in Uruguay (Zorron, 1933) shows that Cryphidium differs from Cryphaea only by the

completely rounded leaf apices. The continued separation of the two genera seems to be a relict of century-old thinking where pleurocarpous mosses with blunt leaves were rather mechanically thrust into the genus Neckera. The existence of some members of the Neckeraceae with similar leaves such as Leptodon smithii (Hedw.) Web. & Mohr and species of Pinnatella must have helped perpetuate the separation.

On the basis of my observations I do not consider Cryphidium generically distinct from Cryphaea. The following new combination is necessary.

Cryphaea leucocolea (Mitt.) H. Robinson, comb. nov. Neckera leucocolea Mitt., J. Linn. Soc. Bot. 12: 457. 1869.

Literature Cited

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STUDIES IN THE EUPATORIEAE (ASTERACEAE). LXV.

A NEW GENUS, NEOCABRERIA.

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There is a small group of South American species that because of superficial differences have not previously been placed together in systems of classification. Microscopic examination proves that these species are very closely related to each other, sharing hairs on the inner surface of the corolla and deeply bilobed anther appendages. In general characters the species are Critonoid though the stylar appendages are slightly more papillose than most members of that group. In general habit the group is more like some members of the Gyptoid series which is prominent in eastern South America, but none of these have hairs on the inside of the corolla.

One of the reasons the species have been separated in treatments is because of the pronounced hairiness of one of the species, a condition that extends on to the surface of the receptacle. The real relationships of the species seem very remote from anything else which has been placed in the section Hebeclinium, however. The two primary species also differ in the number of flowers per head. Neocabreria serrulata is usually cited as having 10-12 flowers while N. malacophylla usually has 20-25 flowers.

With this distinctive genus we wish to honor the noted South American botanist and author of many papers on the Eupatorieae, Angel L. Cabrera, Director of the Museo de La Plata, Argentina.

Neocabreria R.M.King and H.Robinson, genus novum Asteracearum (Eupatorieae). Plantae herbaceae vel suffrutescentes erectae pauce ramosae. Caules subglabri superne parce vel dense pubescentes. Folia opposita breviter petiolata angusta elliptica basi cuneata margine serrulata superne parce pubescentia inferne villosa. Inflorescentiae corymboso-paniculatae; pedicelli pubescentes. Involucri squamae imbricatae 25-30 inaequilongae 3-4 seriatas oblongae extus parce pubescentes intus glabrae vel hirsutae; receptacula plana vel pauce convexa glabra vel dense hirsuta. Flores 10-25 in capitulo; corollae anguste infundibulares 5-lobatae extus inferne glabrae intus hirsutae, cellulis oblongis parietibus interioribus plerumque sinuosis, lobis aequilateraliter triangularibus vel longioribus extus glabris vel glanduliferis ad apicem vix mamillosis intus laevibus; filamenta antherarum in parte superiore angusta,

cellulis infernis plerumque quadratis, parietibus annulis plerumque transversis ornatis, thecis basi non hastatis cellulis exothecialibus subquadratis, appendicibus antherarum valde bilobatis. styli inferne non incrassati glabri, appendicibus late linearibus dense mamillosis vel sublaevibus; achaenia prismatica 4-5-costata setifera inferne angustata, punctis plerumque in seriebus transversis; carpopodia indistincta; pappus setiformis uniseriatus, setis 30-40 usque ad apicem rigidis non dilatatis scabris persistentibus, cellulis apicalibus acutis.

Species typica: Eupatorium serrulatum A.P.Decandolle.

Our studies of the genus indicate that it contains the following three species.

Neocabreria concinna R.M.King & H.Robinson,
nom. nov. Eupatorium concinnum A.P.Decandolle, Prodr. 5:
156. 1836. not E. concinnum Hook. & Arn. Brazil.

Neocabreria malacophylla (Klatt) R.M.King & H.Robinson, comb.
nov. Eupatorium malacophyllum Klatt, Jahrb., Hamburg. Wiss.
Anstalt., 9: 125. 1892. Eupatorium niederleinii Hieronymus,
Bot. Jahrb. 22: 763. 1897. S. Brazil to N. Argentina.

Neocabreria serrulata (A.P.Decandolle) R.M.King & H.Robinson,
comb. nov. Eupatorium serrulatum A.P.Decandolle, Prodr. 5:
147. 1836. Eupatorium acuminatum Hook. & Arn., Comp. Bot.
Mag. 1: 241. 1835 (1836). S.Brazil.

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STUDIES IN THE EUPATORIEAE (ASTERACEAE). LXVI.

THE GENUS, PACHYTHAMNUS.

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Careful reconsideration causes us to raise the rank of a subgenus which we described some years ago (King & Robinson, 1970) under the genus Ageratina. The single species involved is one of the most specialized toward xeric habitats of any in the Eupatorieae. The thickened stems and the seasonally leafless condition are reminiscent of other Mexican plants such as Cnidioscolus and Senecio praecox A.P. Decandolle.

The striking differences in habit are reinforced by two anatomical features of the flower. The corolla lobe is more papillose on the outer surface than other species that we have treated in Ageratina. This characteristic is of considerable significance when the consistently thickened and smooth outer surfaces of the lobes of other Ageratins are considered. The second distinction is the lack of enlargement at the base of the style. Almost all other species in Ageratina and the closely related genera have a distinct enlargement just above the nectary. Sometimes this consists of simply a ring of enlarged cells but in some cases a very large node is present. There is a small group of species without an enlarged base on the style that we retain in the genus Ageratina. This last group consists of A. pentlandiana and its relatives in Peru, and these show none of the other specialized features of the Mexican species that we are placing here in a separate genus.

The genus Pachythamnus is closely related to Ageratina and the carpopodium is of the type found in Ageratina subgenus Neogreenella. It is the latter subgenus of Ageratina that we feel contains the more primitive elements of that genus and there is no reason to suggest that Pachythamnus has to be of particular recent origin.

Pachythamnus (R.M. King & H. Robinson) R.M. King & H. Robinson, new status. Ageratina subgenus Pachythamnus R.M. King & H. Robinson, Phytologia 19:228. 1970.

Perennial shrubs or small trees. Stems swollen, glabrous, terete when fresh, leafless during dry season, with inflorescence terminal on stems or branches and withering and falling after flowering, new leafy branches by subfloral innovation. Leaves

opposite distinctly long petiolate; laminae broadly ovate to deltoid, margin with a few blunt teeth. Inflorescence rather densely corymbose; heads ca. 15 flowered; involucre of ca. 15 rather narrow usually acute subimbricate mostly subequal phyllaries in 2-3 series; receptacle slightly convex, with minute scattered hairs. Corolla narrowly funnelform; outer surface and margins of lobes smooth below, with projecting cells at the tip, without hairs or glands, without stomates; inner surface of lobes papillose with long projecting cells; cells of backs of lobes and of tube mostly narrow with sinuous walls. Anther collar composed of numerous quadrate cells below, elongate cells above, all with little or no ornate thickening on the walls; exothecial cells in part usually lax and somewhat longer than wide; anther appendage large, pollen spherical, tricolpate, spinose, type II sometimes present. Style base glabrous, without swollen node; surface cells of stylar appendage densely long projecting. Achene prismatic, usually 5-costate, bearing setae; carpopodium distinct but without distinct upper limit, rounded, with rather lax quadrate cells having thin beaded walls; basal vasculature of achene united to upper level of carpopodium; pappus of ca. 25 slender scabrous setae rather easily deciduous, with pointed apical cells.

Type species: Eupatorium crassirameum B.L.Robinson

The genus is monotypic.

Pachythamnus crassirameus (B.L.Robinson) R.M.King & H.Robinson, comb. nov. Eupatorium crassirameum B.L.Robinson, Proc. Am. Acad. 35: 332. 1900. Mexico, C. Amer.

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DISCOMYCETE FLORA OF ASIA, PRECURSOR IV:

A NEW SPECIES OF *BIFUSELLA* (RHYTISMATACEAE, HYPODERMATEAE)

ON *CUNNINGHAMIA* IN OKINAWA¹

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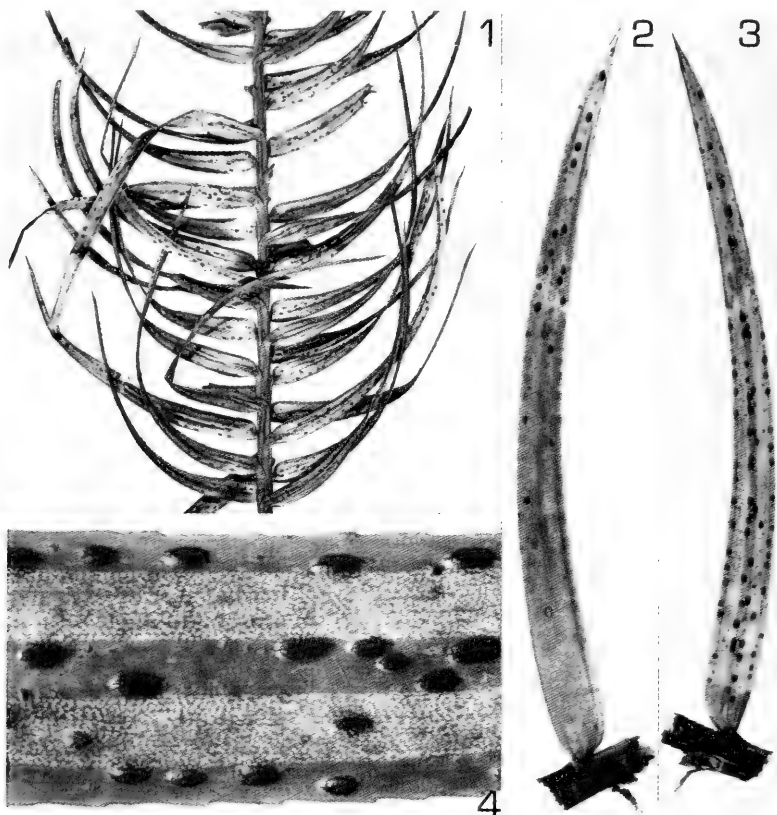
Cunninghamia lanceolata Hook., a handsome Taxodiaceous species, has been introduced in experimental plantings in the Yona Demonstration Forest on the island of Okinawa in the Ryukyus. In the course of a survey of forest fungi, the authors noted a rather spectacular disease of this tree in that planting (FIG. 1), and the senior author has twice since recollected the fungus. The causal agent is a species referable to the tribe Hypodermateae of the family Rhytismataceae (usually called the Hypodermataceae). It has the characteristic dumbbell shaped spores which Darker (1932) termed "bifusiform." As is typical of all members of the family, the ascospores are surrounded by a gelatinous sheath both within the ascus and on discharge (FIG. 5), and in this species are often also coiled or twisted (FIG. 7).

The glistening black ascocarps are elongate ellipsoid, oriented longitudinally on the leaf, a few occurring scattered on the upper surface (FIG. 2), with a larger number occurring on the lower surface where they are almost completely restricted to three rows that are separated by peculiar whitish bands characteristic of the leaves of the host species (FIGS. 3, 4). The ascocarps open by a longitudinal cleft to expose the hymenium in wet weather, closing again under drier conditions. Such ascocarps have been termed hysterothecia or uniapothecial stromata.

¹. Previous articles in this series appeared in *Lloydia* 26: 16-20, 21-26 (1963), 28: 113-119 (1965).

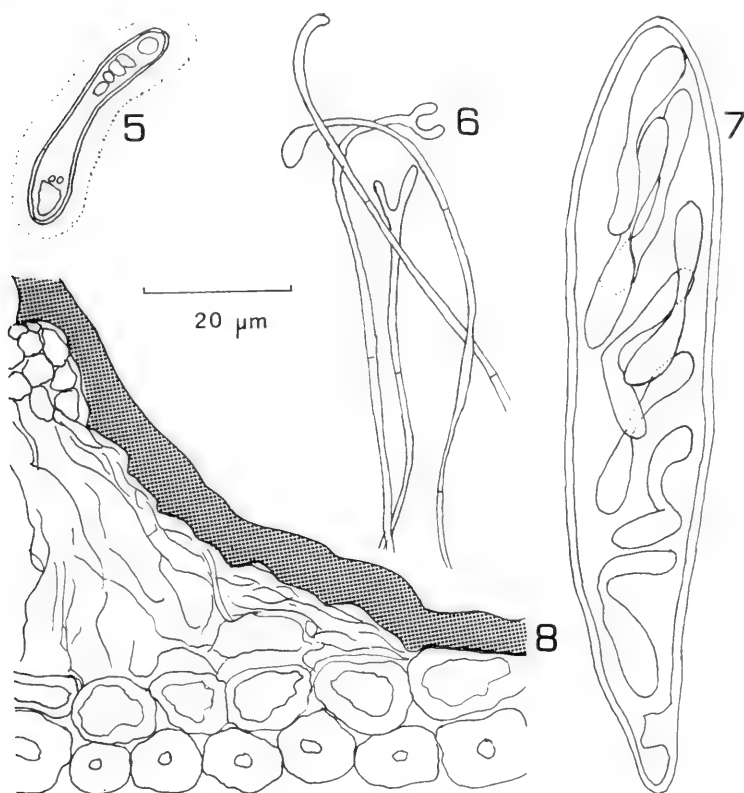
². Supported in part by National Science Foundation Grant GB-8548, and also by the U.S. Office of Education, the University of the Ryukyus, and the U.S. Civil Administration of the Ryukyu Islands while the junior author was a Consultant in their Forest Diseases program.

In a recent revision of the family (Darker, 1967) several new genera and new generic concepts have been advanced. Bifusiform ascospores occur in five genera. In *Bifusepta* Darker, on *Vaccinium*, the spores are septate; in the others, as in the Okinawan fungus, the spores are non-septate. In *Duplicaria* Fuckel the ascocarps are sub-spherical, open irregularly, and are not on conifers. The species of



FIGS. 1-4. Photomicrographs of *Bifusella cunninghamiicola* on the dead leaves of *Cunninghamia lanceolata*. FIG. 1. Portion of a branch with ascocarps, $\times 1$. FIG. 2. Upper surface of a leaf with scattered ascocarps, $\times 2$. FIG. 3. Lower surface of the same leaf with ascocarps in three longitudinal rows, $\times 2$. FIG. 4. Ascocarps at a greater magnification, longitudinally oriented clefts visible, developing almost wholly between the two longitudinal whitish bands on the lower leaf surface, $\times 16$. All photographs from the holotype specimen, taken by Howard H. Lyon, Department of Plant Pathology, Cornell University.

the remaining three genera were all at one time or another referred to the genus *Bifusella* von Hühnel, have ellipsoid to linear ascocarps, and occur on coniferous hosts. It is to this "*Bifusella* complex"



FIGS. 5-8. Camera lucida drawings of *Bifusella cunninghamicola*, from the holotype specimen, $\times 1000$. FIG. 5. Mature ascospore showing the thick gelatinous sheath and various inclusions within the spore. FIG. 6. Apices of paraphyses. FIG. 7. An ascus containing eight, mostly vermiform, bifusiiform ascospores. FIG. 8. Vertical freezing microtome section through the extreme edge of an ascocarp, the thick-walled epidermal cells at the base, with even thicker-walled hypodermal cells below them, the host cuticle (shown shaded) raised by the ascocarp and adhering closely to the upper surface of the ascocarp, the cells of the stroma mostly gelatinized at the margin and difficult to differentiate, at the upper portion of the section at the left with cells more typical of the stroma, forming a brown-walled textura angularis.

(Darker, 1967) that the species on *Cunninghamia* belongs.

Bifusella was erected by von Höhnelt (1917) for a single species, *B. linearis* (Peck) v. Höhn., on the needles of *Pinus strobus* L. He noted as generic distinctions that the ascocarps are subcuticular (rather than intraepidermal as in *Hypoderma*), the bifusiform shape of the spores, and the absence of paraphyses. A second species, on *Abies*, was added to the genus by Dearness (1926), and three new species, on *Abies*, *Picea* and *Pinus*, brought the number of species recognized by Darker (1932) to five. That critical monograph of the species of this family on conifers resulted in a much broadened generic concept.

Darker's (1967) more recent treatment of *Bifusella* differs significantly from that in his earlier monograph. The subepidermal *B. striiformis* Darker, on *Pinus*, is now removed to become the monotype of a new genus, *Soleella* Darker. The two "nervisquious" species on *Abies* are now both treated in the new genus *Isthmiella* Darker as *I. abietis* (Dearn.) Darker and *I. faulii* (Darker) Darker. The non-nervisquious species on *Picea* became *I. crepidiformis* (Darker) Darker. These four species differed from the type species, *B. linearis*, in having persistent paraphyses and in not being subcuticular.

The newer treatment, having removed all but the type species from the genus, then proceeded to add two species Darker (1932) had earlier placed in *Hypoderma*. Neither of these agree very well with the type species in spore morphology, for they have cylindrical or rod-shaped ascospores which at most could be termed "tending toward a bifusiform condition" as mentioned in the revised generic diagnosis for *Bifusella*. Both *B. saccata* (Darker) Darker and *B. pini* (Dearn.) Darker are said, however, to be subcuticular³, unlike typical members of *Hypoderma*, and both occur on soft pines as does the type species. All three of the species now recognized by Darker also possess large, conspicuous pycnidia.

Our fungus from Okinawa agrees well with the type species of *Bifusella* both in spore characters and in being strictly subcuticular. Unlike the three species on *Pinus*, however, pycnidia are unknown. The presence or absence of paraphyses in those species has been variously reported. For *B. linearis* von Höhnelt (1917) reported: "Paraphysen fehlen. Doch findet man hier und da einzelne 1 μ dicke Hyphen zwischen den Schläuchen." These interthecial hyphae are apparently analogous to the paraphyses seen in our material (FIG. 6). Darker (1932) unequivocally stated "Aparaphysate" for the species, but later (Darker, 1967, p. 1413) notes that "the paraphyses disappear so early in the development that the species has come to be regarded as aparaphysate." Of the two species he transfers from *Hypoderma*, he states that in *B. pini* the paraphyses disappear early, while in *B. saccata* "the paraphyses though more persistent finally undergo lysis and at maturity may be lacking." In our fungus the paraphyses certainly do not disappear early, since they may be found profusely in apparently completely mature ascocarps which open widely to expose the hymenium in moist weather. While it is possible that the paraphyses undergo lysis at maturity or post-maturity in the Okinawan species, this has not yet

³. *B. pini* was stated by Darker (1932) to be intraepidermal.

been demonstrated.

Bifusella cunninghamiicola Korf & Ogimi, sp. nov.

Hysterothecia ellipsoidea, nigra, subcuticularia, 0.3-0.4 × (0.5-) 0.6-0.75 mm, amphigena; stroma ex textura angulari formata, parietibus brunneis, cellulis 3-6 (-8) μm diam.; asci late clavati, octospori, J—, (17-) 19-22 × 90-110 (-120) μm; ascospores bifusi-formes, plerumque vermiformes, ad isthmum (2-) 3-4 μm latae, ad extremitates 4.5-5.5 (-6.5) μm latae, 28-36 (-40) μm longae, hyalinae; paraphyses filiformes, graciles, 1 μm latae, persistentes, circinatae, apice clavato vel difformi. Intra folia *Cunninghamia lanceolata* in Okinawa. Holotypus: CUP-JA 3437.

Ascocarps ellipsoid, hysterioid, black, 0.3-0.4 × (0.5-) 0.6-0.75 mm, opening widely when moist by a longitudinal cleft that is faintly fimbriate and somewhat whitish to expose the pallid to beige disc, amphigenous (fig. 1), sparse and irregularly disposed on the glabrescent upper surface of the leaf (fig. 2), more densely arranged into 3 longitudinal rows on the lower surface (fig. 3), the rows separated by broad whitish bands characteristic of the host species (fig. 4), the long axis of the ascocarp parallel to the long axis of the leaf, subcuticular (fig. 8). *Spermatia* or *conidia* unknown, presumably absent. In section: *hymenium* 110-120 μm thick; *subhymenium* and *medullary tissue* indistinguishable from one another, very reduced, 5-10 μm thick, of *textura intricata* seated on the scarcely modified epidermal cells, somewhat gelatinized toward the basal edges, hyaline; *covering stroma* mostly of *textura angularis* with somewhat thickened, brown walls, the individual cells 3-6 (-8) μm in diam, paler and more hyphoid at the base, ca. 20 μm thick at the sides, flaring to 40 μm thick toward the cleft, at the cleft suddenly enlarged to ca. 80 μm thick and provided there with subhyaline, glassy-walled apices ca. 15 × 3 μm that form the fringe at the cleft, covered nearly to the cleft by the closely adherent host cuticle (fig. 8). *Asci* broad clavate, with a pore not blue in iodine (J—), arising from gnarled, repeating croziers, 8-spored, (17-) 19-22 × 90-110 (-120) μm (Fig. 7). *Ascospores* bifusiform or dumbbell-shaped, hyaline, non-septate, often twisted or vermiform (fig. 7), (2-) 3-4 μm wide at the central isthmus, ends swollen to 4.5-5.5 (-6.5) μm, length when not coiled 28-36 (-40) μm, surrounded in the ascus and after discharge by a thick, hyaline, gelatinous sheath (fig. 5), oil drops and other inclusions mostly polar and not in the isthmus. *Paraphyses* about as long as the asci, gracile, mostly unbranched below, ca. 1 μm broad, remotely septate, often apically branched one or more times with tips usually circinate, apices usually clavately swollen or sometimes irregularly distorted, 1.5-2 (-3) μm broad, hyaline, persistent (fig. 6).

SPECIMENS EXAMINED: On leaves of *Cunninghamia lanceolata*, 20-50 m elev., Yona Demonstration Forest, Yona, Okinawa, Ryukyus, 19. IV. 1969, Korf & Ogimi CUP-JA 3437, HOLOTYPE (CUP), ISOTYPES: DAOM, K,

TNS, Dept. Forestry, University of the Ryukyus, Naha, Okinawa. PARATYPES: Same substrate, same locality, 10-100 m elev., 10. II. 1971, *Ogimi*, Dept. Forestry, University of the Ryukyus, Naha, Okinawa; Same substrate, same locality, 2. V. 1971, *Ogimi*, Dept. Forestry, University of the Ryukyus, Naha, Okinawa.

There are two other members of the Rhytismataceae reported on the leaves of *Cunninghamia lanceolata*, but both should be easily distinguished on field characters as well as microscopic features. Neither species has the constricted ascospores so characteristic of *Bifusella cunninghamicola*. In the case of *Lophodermium petrakii* Durrieu (1957) the long filiform ascospores ($56-72 \times 1.5-2.0 \mu\text{m}$) are borne in subcuticular ascocarps which are scattered on the leaf with the clefts randomly oriented. Darker's supposition that the reports of *Lophodermium pinastri* (Schrad. per Hook.) Chev. (Teng, 1932), and of *L. uncinatum* Darker (Teng, 1933), both on this host from China represent instead Durrieu's species are at least partially confirmed by studies of the junior author. The undestroyed portion of the Chinese National Fungus Herbarium is on deposit in CUP (part of this collection is also on deposit at BPI). The report of *L. pinastri* is based on Teng 1005, but that specimen was also cited when Teng (1933) apparently reidentified it as *L. uncinatum*. While the Teng 1005 cannot be located at CUP, another specimen cited in 1933 is deposited as *L. uncinatum*, Teng 1940. This specimen is clearly *L. petrakii*. The intraepidermal ascocarps of the second species, *Hypoderma handelii* Petrak⁴, are also not regularly aligned as in *B. cunninghamicola*, and the bacillar ascospores are shorter and 1-septate ($13-22 \times 4-6 \mu\text{m}$ fide Petrak, 1947). Another fungus which might conceivably be confused with these is *Lophiosphaera orientalis* Hino & Katumoto (1964) which also occurs on the leaves of *Cunninghamia*, but the ascostromata of that species are deeply immersed

⁴. This species is referred to as *H. cunninghamiae* (Keissl.) Teng by Darker (1967), but Petrak's name is the correct one for the fungus at species rank. Although *H. strobicola* Tub. f. *cunninghamiae* Keissler (1924) was validly published, Teng (1936) did not know of this paper and adopted Keissler's epithet only from a herbarium label. Teng's name is not validly published under Art. 36 of the International Code of Botanical Nomenclature since he provided neither a new nor a reference to a previously published Latin description or diagnosis. When Petrak (1947) reworked Keissler's Chinese material he cited primarily a later paper (Keissler, 1937), decided the fungus deserved species rank, and gave it a new name rather than adopting Keissler's epithet for the forma (as he is permitted to do under the Code). The somewhat confusing synonymy is:

Hypoderma handelii Petrak (as "*Handelii*"), Sydowia 1: 371. 1947.
 = *Hypoderma strobicola* Tub. f. *Cunninghamiae* Keissl., Akad. Wiss. Wien Anzeiger, Math.-Naturwiss. Kl. 61: 13. 1924.
 = [*Hypoderma Cunninghamiae* Teng (as "(Keissl.) Teng"), Sinensia 7: 261. 1936, not validly published.]

and the ascospores 1-septate, fusoid, and appendaged; its asci are bitunicate, as is characteristic of the Lophiostomataceae, to which the species seems correctly referred.

As delimited and redefined here, the genus *Bifusella* is to be accepted for two, or possibly four, species, all of which occur on the leaves of conifers. All of the other species assigned to this genus which occur on conifers have been excluded by Darker (1967), and have been discussed above. Two other species which do not occur on conifers have, however, been referred to the genus, "*B. vaccinii* Tehon" and *B. acuminata* (Ellis & Everh.) Bonar & Cooke. The first of these is now the type species of *Bifusepta*, *B. tehonii* Darker, and occurs on the stems of *Vaccinium*. The second, a species not mentioned by Darker (1967), occurs on the culms of Juncaceae and Cyperaceae, and was originally placed in the genus *Duplicaria*. Neither of these species now appears to be congeneric with *Bifusella linearis* or *B. cunninghamicola*, and the junior author will discuss both at greater length in his monographic study of *Duplicaria* now in preparation.

It is not yet known how serious this disease is in Okinawa, nor whether any successful control measures can be found. Though *Cunninghamia lanceolata* is widely grown in Asia, this disease has apparently never been noted before its discovery in the experimental forest at Yona. Whether the fungus was brought to Okinawa with the seeds of *Cunninghamia*, or possibly exists also on some other Taxodiaceae or Pinaceous host plant endemic to Okinawa, is also unknown. The senior author is continuing his studies of the disease.

要 旨

Cunninghamia lanceolata のこれまでに知られていない病気が沖縄の実験森林に発生した。病因はここに記述されている *Bifusella cunninghamicola* Korf & Ogimi sp. nov. であります。この種は *Bifusella* 属の type である *B. linearis* と比較されています。 *B. cunninghamicola* は持続性のある側糸を有している反面、 *B. linearis* は無側糸であります。また、 *Bifusella* 属は Hypodermateae に属する他の四属 (*Dupli-*

caria, *Bifusepta*, *Isthmiella*, *Soleella*) とともに比較されています。 *Bifusella cunninghamicola* と *C. lanceolata* に発生するこれと混同されやすい他の三種の菌類 *Lophodermium petrakii*, *Hypoderma handelii* (= *H. cunninghamiae*) と *Lophiosphaera orientalis* との相異点も検討されています。

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DESCRIPTIONS OF NEW SPECIES AND COMBINATIONS
IN ERIOGONUM (POLYGONACEAE)

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During the course of a preliminary revision of the genus *Eriogonum* (Polygonaceae), a number of new combinations were found necessary, and a few undescribed entities were discovered. For the most part these new taxa and combinations will remain unpublished awaiting a final monograph. Others, however, must be made at this time in connection with various floristic projects in the western United States.

Eriogonum ammophilum Reveal, spec. nov.

Eriogono hearneyi Tidestr. affinis sed caulibus glabris, foliis satis basalibus et latioribus, et pedunculis obviis; a *E. nummulari* M.E. Jones foliis non rotundis et caulibus non lanatis differt.

Fruticuli 2-4 dm alti ex caudicibus subterraneis; *folia* dispersa secus caules ad basim, laminis ellipticis vel late ellipticus, 1-2.5 (2.8) cm longis et 8-17 mm latis, subtus albo-tomentosis, supra subglabris et viridibus, petiolis 1-5 (15) mm longis, basibus expansis petiolorum 1.5-2 mm longis et 1-1.5 mm latis, tomentosis; *caules* glabri, 5-15 cm longi; *inflorescentiae* cymosae, glabrae, 1-2.5 mm longae; *pedunculi* glabri, (2) 5-10 (12) mm longi et erecti; *involucra* solitaria, turbinata, (2.5) 3-3.5 mm longa et 2-2.5 mm lata, glabra, lobis 5, acutis, 0.4-0.8 mm longis, bracteis linearibus vel oblanceolatis, 1.5-2 mm longis, pedicellis glabris, 2.5-4 mm longis; *flores* albi, 2-3 mm longi, glabri, tepalis \pm similaribus, anguste obovatis, (0.5) 1-1.7 mm latis; *stamina* exserta, 2.5-3.5 mm longa, filamentis parce puberulis, antheris roseis vel purpureis, 0.5-0.6 mm longis; *achaeis* ignota.

Low herbaceous subshrubs, erect and spreading, 2-4 dm high, 2.5 dm across, the caudices woody, brown, deeply buried in sand, leafless, the upper branches herbaceous, thin, glabrous and glaucous; *leaves* solitary, alternate and rather closely congested along the lower part of the branches just above the level of the sand, the leaf-blade elliptic to broadly elliptic, 1-2.5 (2.8) cm long, 8-17 mm wide, densely white-tomentose below, less so to subglabrous and green above, the base obtuse, the apex obtuse to rounded, the leaves soon deciduous, the plants leafless at matur-

ity, the petiole slender, 1-5 (15) mm long, lanate to tomentose, the petiole-base triangular, 1.5-2 mm long, 1-1.5 mm wide, lanate or nearly so; *flowering stems* slender, few to several per plant, 5-15 cm long, glabrous and glaucous, lanate amongst the leaves below; *inflorescences* cymose, trichotomous at the first node, dichotomous above, 5-20 cm long, up to 25 cm across, open, glabrous and glaucous; *bracts* ternate, scale-like, 1-2.5 mm long, 1-2 mm wide, triangular, glabrous without, tomentose within, connate at the base; *peduncles* slender and erect, (2) 5-10 (12) mm long, glabrous and glaucous; *involucres* solitary, turbinate, (2.5) 3-3.5 mm long, 2-2.5 mm wide, glabrous within and without, the 5 acute teeth 0.4-0.8 mm long, the bractlet linear to oblanceolate, 1.5-2 mm long, sparsely fringed with short capitate gland-tipped cells, white, the pedicel glabrous, 2.5-3 mm long; *flowers* white with a reddish-brown midrib and base, 2-3 mm long, glabrous within and without except for a few microscopic glands scattered along the midribs within, the tepals slightly dissimilar, the outer whorl of tepals 1-1.7 mm wide, the inner whorl of tepals narrower, 0.5-0.9 mm wide, united only at the base; *stamens* slightly exserted, 2.5-3.5 mm long, the filament sparsely puberulent basally, the anther red to purple, 0.5-0.6 mm long, oblong; *achenes* unknown.

TYPE: About 1.3 miles northwest of Ibex Warm Point on a dry sandy flat associated with *Tetradymia*, *Oryzopsis* and *Ceratoides* [= *Eurotia*], T.22S., R.14W., sec. 30, at 5270 feet elevation, Millard Co., Utah, 4 August 1970, Holmgren & Holmgren 4650. Holotype: US! Isotypes: BRY, NY, UTC!

ADDITIONAL SPECIMENS SEEN: UTAH: Millard Co.: Ibex Range Enclosure just south of Ibex Warm Point on a sandy flat, T.22S., R.14W., sec. 32, 19 June 1965, R.C. Holmgren 479 (BRY, NY, USFS, UTC).

Eriogonum ammophilum is a low herbaceous subshrub similar to *E. kearneyi* Tidestr. and *E. nummulare* M.E. Jones. It resembles, and is technically most closely related to, the Kearney Buckwheat in its habitat, leaves and open inflorescence, but it is not as woody in the above-ground parts as is typical of *E. kearneyi*. In this respect, the new species approaches the rare, western Utah species, *E. nummulare*. They share a similar inflorescence structure and other features such as leaf pubescence type. However, the two differ in shape and structure of the leaves, flowers and stem vesture. As now seen, *E. ammophilum* represents an end line in the evolutionary development of a small group of species typified by *E. leptocladon* Torr. & Gray.

These species may be separated as follows:

- A. Leaves linear-lanceolate to narrowly oblanceolate, 1.5-4.5 cm long, 3-6 mm wide; branches tomentose or glabrate and floccose; flowers white or yellow; sandy deserts, Emery Co., Utah

southward to Coconino Co., Arizona, eastward into southwestern Colorado and northwestern New Mexico..... *E. leptocladon*

AA. Leaves oblanceolate to elliptic or orbicular to rounded, 0.5-2.5 (3) cm long, 5-15 mm wide; flowers white.

B. Leaves oblanceolate to elliptic, 1-2.5 (3) cm long.

C. Stems and inflorescences tomentose, rarely glabrate; leaves scattered along the lower stems; involucre sessile, 2-2.5 mm long; common in western Utah from Tooele Co. southward to northern Mohave Co., Arizona, westward across southern and central Nevada to Washoe Co., entering California in Mono Co. and extending southward into Owens Valley of Inyo Co. *E. kearneyi*

CC. Stems and inflorescences glabrous and glaucous; leaves densely clustered near the base of the stems; involucre peduncled, at least in the forks of the branches, the peduncle (2) 5-10 (12) mm long, the involucre (2.5) 3-3.5 mm long; local and infrequent, near Ibex Warm Point, Millard Co., Utah..... *E. armophilum*

BB. Leaves orbicular to rounded, 0.5-1 cm long and wide, clustered at the base of the stems, densely white-tomentose on both surfaces; stems densely lanate; involucre short peduncled, the peduncles up to 1 cm long; rare, known only from sandy areas in extreme western Juab and Tooele cos., Utah..... *E. nummulare*

Eriogonum eremicum Reveal, spec. nov.

Eriogono ostlundii M.E. Jones affinis sed foliis ovatis vel rotundis, subtiliter tomentosis, laminis 1.2-2 cm longis et 1-1.7 cm latis, involucris plerumque congestis, 2.5-4 mm longis.

Plantae herbaceae perennes 2.5-4.5 dm altae et caudicibus; *folia* basalia, laminis ovatis vel rotundis, 1.2-2 cm longis et 1-1.7 cm latis, subtiliter albo-tomentosis, basi rotundis vel truncatis, petiolis 1-2.5 cm longis, tomentosis, basibus expansis petiolorum 2-3 mm longis et latis, tomentosis; *caules* glabri, 5-20 cm longi; *inflorescentiae* cymae, glabrae, 12-25 cm longae; *bractae* ternariae, glabrae, 1-3 mm longae; *pedunculi* nulli; *involucrea* plerumque congesta, 2.5-4 mm longa et 2-2.5 mm lata, lobis 5, rotundis vel acutis, 0.4-0.8 mm longis, bracteolis linearibus, 1.5-3 mm longis, pedicellis 2.5-4 mm longis, glabris; *flores* albi, 2.5-3 mm longi, tepalis similaribus, obovatis, 0.8-1.5 mm latis; *stamina* exserta, 2.5-3.5 mm longa, filamentis parce puberulis, antheris rubris, 0.5-0.6 mm longis; *achaeia* 3 mm longa.

Spreading herbaceous perennials 2.5-4.5 dm high and 1-2.5 dm across, with short woody, somewhat congested, caudex branches 5-10 cm across, arising from a slender woody taproot; *leaves* strictly

basal, the leaf-blade ovate to round, 1.2-2 cm long, 1-1.7 cm wide, finely tomentose on both surfaces, the apex rounded, the base rounded to truncate, the margin entire and plane, the petiole 1-2.5 cm long, tomentose, the petiole-base triangular, 2-3 mm long and wide, tomentose to floccose without, subglabrous to glabrous within; *flowering stems* erect, 5-20 cm long, glabrous and green, remaining pubescent amongst the leaves at the very base; *inflorescences* cymose, 12-25 cm long, 1-2 dm across, divided several times, trichotomous at the lower nodes, dichotomous above, the crown open, glabrous; *bracts* ternate, scale-like, 1-3 mm long, 0.8-1.3 mm wide, narrowly triangular, glabrous without, sparsely tomentose within, connate at the base; *peduncles* lacking; *involucres* solitary or more frequently clustered, turbinate, 2.5-4 mm long, 2-2.5 mm wide, glabrous within and without, the 5 rounded to acute teeth 0.4-0.8 mm long with a membranous margin, the bractlet linear, fringed with minute gland-tipped cells, 1.5-3 mm long, the pedicel 2.5-4 mm long, glabrous; *flowers* white with a reddish-brown to greenish midrib and base, 2.5-3 mm long, glabrous within and without except for minute glands along the midrib within, the tepals essentially similar, obovate, 0.8-1.5 mm wide, the inner whorl of tepals slightly narrower, united less than 1/5 the length of the flower; *stamens* slightly to long exerted, 2.5-3.5 mm long, the filament sparsely pubescent basally, the anther red to rose, 0.5-0.6 mm long, oblong; *achenes* light brown, 3 mm long, the broadly globose base tapering to a long 3-angled beak.

TYPE: Common on scattered low sagebrush, *Atriplex* and *Oryzopsis* covered hills on gravelly soil, 17 miles southeast of Garrison, Millard Co., Utah, along Utah Highway 21, at 5650 feet elevation, 23 July 1965, *Holmgren, Reveal & LaFrance 2247*. Holotype: UTC! Isotypes: ARIZ, BRY, CAS, GH, MO, NY, OKL, RM, RSA, UC! -- Distributed under the name *Eriogonum batemanii* M.E. Jones.

ADDITIONAL SPECIMENS SEEN: UTAH: Millard Co.: Antelope Valley, 21 August 1967, *Alder 73* (BRY, DRES¹, USFS); West of Wa Wa, 26 June 1906, *M.E. Jones s.n.* (DS, NY, PH, POM, US); 2 miles west of Cowboy Pass, 8 August 1941, *Maguire 21228* (GH, NY, UC, UTC, WTU); 25 miles southeast of Garrison on low limestone hills, along Utah Highway 21, 6200 feet elevation, 28 July 1971, *Reveal 2544* (NY, US, UTC); 10 miles east of Robinson's Ranch, 1 August 1963, *Welsh & Moore 2251* (BRY).

This new species has been known for some time, being first collected by Marcus E. Jones in 1906 and irregularly rediscovered by various people associated with the United States Forest Service and the Desert Range Experiment Station in Millard Co., Utah. It is well isolated and separated from its two most closely related

¹DRES stands for the Desert Range Experiment Station, U.S. Forest Service, Milford, Utah.

species, *Eriogonum ostlundii* and *E. batemanii*, both originally described by Jones in 1903.

Eriogonum batemanii is a wide spread species found in the Colorado-Green river drainage system of eastern Utah and adjacent western Colorado. Its range extends from the foothills of the Uinta Mountains in the north, south to the Henry Mountains of Garfield Co., Utah, and then eastward into Moffatt and Rio Blanco cos., Colorado. It is similar to *E. eremicum* in the clustered involucre, glabrous stems and strictly basal leaves. The two differ in leaf shape and size, the type of the tomentum, the flower length and general ecology of the sites - with *E. batemanii* most frequently being found on clay soils while *E. eremicum* is encountered mainly on gravelly limestone soils.

The relatively restricted *Eriogonum ostlundii* occurs among pines (both *Pinus ponderosa* and *P. edulis*) and sagebrush along the Sevier River drainage of Piute and Sevier cos., Utah. It is clearly related to *E. eremicum*, but the two differ in numerous subtle ways in both ecology and morphology. They differ in leaf shape, involucre size and number in any given cluster, flower length and the branching pattern of the inflorescence.

These three species, plus the recently described *Eriogonum cronquistii* Reveal, all belong to a small group of species found primarily in Utah. They may be distinguished as follows:

- A. Leaves elliptic to spatulate, densely white-tomentose below, floccose and green above, or if tomentose on both surfaces, then plants of eastern Utah; leaf-blades tapering to the petioles.
- B. Involucre 2-2.5 mm long, not clustered; leaf-blades 1-1.5 cm long, elliptic to spatulate; inflorescences with numerous, thin, branches making up more than half the height of the plant; flowers 1.5-2.3 mm long; peduncles, when present, up to 1 cm long, erect; rocky slopes and clay foothills and flats, Piute and Sevier cos., central Utah.
..... *E. ostlundii*
- BB. Involucre 2.5-4 mm long, usually clustered; eastern Utah and adjacent western Colorado.
- C. Leaves not crenulate, the leaf-blade (1.5) 2-4 cm long, elliptic; plants 2-4 dm high, compact, not at all spreading; flowers 1.5-2.8 mm long; peduncles lacking; clay slopes, mounds and washes, Duchesne and Uintah cos. southward into Garfield Co., Utah, hence eastward into western Colorado.... *E. batemanii*
- CC. Leaves crenulate, the leaf-blade 0.5-2 cm long, elliptic; plants (0.7) 1-1.5 (2) dm high, spreading;

flowers (1.5) 2-3 mm long; peduncles lacking; steep talus slopes, Bull Mountain, Henry Mountains, Garfield Co., Utah..... *E. cronquistii*

- AA. Leaves nearly rotund to ovate, densely white-tomentose on both surfaces, the leaf-blade 1.2-2 cm long, 1-1.7 cm wide, not tapering to the petiole; plants 2.5-4.5 dm high, the inflorescence less than half the height of the plant; flowers 2.5-3 mm long; peduncles lacking; involucre 2.5-4 mm long; dry slopes and rocky hillsides in gravelly limestone places of western Millard Co., Utah..... *E. eremicum*

Eriogonum argophyllum Reveal, spec. nov.

A *Eriogono kingii* S. Wats. differt foliis 4-8 mm longis et 2-5 mm latis, albo-tomentosis, petiolis 0.5-1 (1.5) mm longis, scapis gracillimis, (4) 5-7 cm longis, involucris 2-2.5 mm longis, floribus luteis, 2.5-3 mm longis, tepalis oblongis.

Plantae humiles compactae perennes crassas tegetes formantes; *folia* oblanceolata vel elliptica, 4-8 mm longa, 2-5 mm lata, dense utrinque albo-tomentosa, petiolis 0.5-1 (1.5) mm longis, tomentosis, basibus expansis petiolorum 1-3 mm longis et 1-2.5 mm latis; *scapi* erecti, gracillimi, (4) 5-7 cm longi, floccosi; *bracteae* lanceolatae, 2-2.5 mm longae, membranaceae, sparse floccosae, 5-6; *involucrea* membranacea, 5-7, 2-2.5 mm longa, lobis lanceolatis, 6-7, extra sparse tomentosis et glandulosis, intra glandulosis, bracteolis lineari-lanceolatis, 0.8-1.3 mm longis, pedicellis glabris, 1.5-2.5 mm longis; *flores* lutei, 2.5-3 mm longi, sparse glandulosi extra secus costum, intus glandulosi, tepalis subaequalibus, oblongis; *stamina* exserta, filamentis 3-3.5 mm longis, sparse puberulis, antheris luteis; *achaeia* 2.8-3 mm longa.

Low compact caespitose herbaceous perennials forming a thick spreading mat with numerous, spreading, woody caudex branches, these densely covered with old persistent leaves and petiole-bases over much of their length, arising from a slender, woody, brownish taproot; *leaves* basal, the leaf-blade oblanceolate to elliptic, 4-8 mm long, 2-5 mm wide, densely white-tomentose on both surfaces, not glandular, the margin entire and plane, the petiole short, 0.5-1 (1.5) mm long, densely tomentose, the petiole-base elongate-triangular, 1-3 mm long, 1-2.5 mm wide, sparsely pubescent with long white hairs without, glabrous within, membranous and ± papery, light brown; *flowering stems* scapose, (4) 5-7 cm long, floccose, erect and very slender; *inflorescences* capitate, the head 5-10 mm across; *bracts* 5-6, lanceolate, 2-2.5 mm long, sparsely floccose, membranous, connate at the base; *peduncles* lacking; *involucres* congested, 5-7 per head, membranaceous, turbinate-campanulate, 2-2.5 mm long, sparsely tomentose especially at the apex without and with scattered glands along the ribs, minutely glandular within and often along the inner margin of the tube, the 6-7 lanceolate, acutish lobes 1-1.5 mm long, the lobes

and involucre tube totally hyaline, the bractlet linear-lanceolate, 0.8-1.3 mm long, the pedicel 1.5-2.5 mm long, glabrous; flowers yellow with a greenish-yellow midrib and base, becoming tinged with reddish-brown at maturity in some, 2.5-3 mm long, sparsely glandular on the midribs without, glandular within especially along the midribs, the tepals subequal, oblong, the outer whorl 1-1.2 mm wide, the inner whorl 0.6-0.8 mm wide, united about 1/3 the length of the flower; stamens exserted, 3-3.5 mm long, the filament sparsely puberulent basally, the anther yellow, 0.5-0.6 mm long, oblong; achenes brown, 2.8-3 mm long, the globose base tapering to a long, 3-angled beak.

TYPE: Common in sandy washes on crusty mineralized sand with *Senecio* below Sulphur Hot Springs, Ruby Valley, Elko Co., Nevada, near Nevada Highway 11, 16.8 miles southwest of the junction with U.S. Highway 93, T.31N., R.59E., sec. 11, at 6050 feet elevation, 7 July 1969, Holmgren & Kern 3661. Holotype: US! Isotypes: BRY, NY, UTC!

ADDITIONAL SPECIMENS SEEN: NEVADA: Elko Co.: Sulphur Hot Springs, 20 June 1941, A.H. Holmgren 1151 (NY, UTC); Sulphur Hot Springs, 18 July 1971, Reveal & Reveal 2527 (BRY, NY, US, UTC).

One of the more fascinating features of *Eriogonum* is the role isolation has played in the development of species. Occasionally the isolation barrier is geographic, where great distances have separated entities and allowed them to develop independently of each other along pathways which may be similar (no doubt due to a relatively high percentage of similar genes) or quite different due to the differences in selective pressures. This type of endemism is seen in *E. gracilipes* S. Wats. of the White Mountains of California and Nevada, and in *E. holmgrenii* Reveal, a species that is restricted to the Snake Range of eastern Nevada. In this case the morphological differences are not great, but the differences are consistent and definable. In the insular endemics off the coast of California and northern Mexico, *E. giganteum* S. Wats., *E. zapatoense* Moran and *E. molle* Greene, here the morphological differences are well pronounced, their geographical isolation well enhanced, and yet some of these species can hybridize when brought together in the garden.

Another feature of endemism in *Eriogonum* is that determined by edaphic specialization. A clear example of this is seen between *E. batemanii* and *E. eremicum* as noted above. However, there is still a touch of spatial isolation here. Some species are highly restricted in their distribution by the nature of the soil they occur on. *Eriogonum saurinum* Reveal is found only on Mowry Shale in Dinosaur National Monument of extreme northeastern Utah and adjacent Colorado. This vertical band of resistant rock is only a few feet wide, and the species is not known to occur off of this substrate.

In the case of *Eriogonum argophyllum*, both edaphic and spatial isolation have played a role in the evolution of this species. It is restricted to crusted mineralized sandy soil below Sulphur Hot Springs at an elevation around 6050 feet. Its most closely related species, *E. kingii* S. Wats., occurs less than 5 airline miles away, but at an elevation of from 9000 to 10,400 feet atop the East Humboldt Range and Ruby Mountains. Even given this short distance, the two have evolved a number of morphological differences, and these are of such a nature as to require a specific rank to place each. At the upper elevations where *E. kingii* is found, it covers large areas of the slopes usually in association with sagebrush, but with an occasional population venturing out onto exposed ridges as near Angel Lake west of the town of Wells. *Eriogonum argophyllum* occurs on more exposed situations, but at a lower elevation; even so, the overall nature of the plants is similar.

The two species are easily distinguished on technical features as noted in the key which follows the next species description.

Eriogonum scopulorum Reveal, spec. nov.

A *Eriogono chrysopsidi* Rydb. foliis (5) 6-9 (10) mm longis et 2.5-4 mm latis, tomentosis et glandulosis, petiolis 2-4 mm longis, scapis (3) 5-7 cm longis, glandulosis, involucris 2.5-3 mm longis, glandulosis et parce tomentosis, floribus stramineis, 2.5-3 (3.5) mm longis, tepalis oblanceolatis differt.

Plantae humiles compactae perennes crassas tegetes formantes; *folia* oblanceolata vel elliptica, (5) 6-9 (10) mm longa, 2.5-4 mm lata, albo-tomentosa et glandulosa, petiolis 2-4 mm longis, tomentosis et glandulosis, basibus expansis petiolorum 3-4 mm longis et (1.5) 2-2.5 mm latis; *scapi* erecti, gracillimi, (3) 5-7 cm longi, glandulosi; *bracteae* triangulares, 1.3-1.6 mm longae, membranaceae, sparse floccosae et glandulosae, 5-6; *involucra* membranacea, 5-7, 2.5-3 mm longa et lata, lobis 5-6, acutis, extra glabris vel sparse tomentosis et glandulosis, intra fere glabris, bracteolis linearibus, 1-1.5 mm longis, pedicellis glabris, 2.5-4 mm longis; *flores* straminei, 2.5-3 (3.5) mm longi, glabri, tepalis similaribus, oblanceolatis; *stamina* exserta, filamentis 3-4 mm longis, sparse pilosis, antheris luteis; *achaeia* 2.5 mm longa.

Low compact caespitose herbaceous perennials forming a thick spreading mat with few to several, spreading, woody caudex branches, these not densely covered with old leaves or petiole-bases, arising from a slender, woody taproot; *leaves* basal, the leaf-blade oblanceolate to elliptic, (5) 6-9 (10) mm long, 2.5-4 mm wide, densely white-tomentose below, slightly less so and more greenish above, glandular, the margin entire and plane, the petiole short, 2-4 mm long, tomentose and glandular, the petiole-

base narrowly triangular, 3-4 mm long, (1.5) 2-2.5 mm wide, thinly tomentose without, glabrous within, membranous and papery, light brown to tan; *flowering stems* scapose, (3) 5-7 cm long, glandular, erect and very slender; *inflorescences* capitate, the head 1-1.5 cm across; *bracts* 5-6, triangular, 1.3-1.6 mm long, sparsely floccose and glandular without, glabrous within, connate at the base; *peduncles* lacking; *involucres* congested, 5-7 per head, membranaceous, turbinate-campanulate, 2.5-3 mm long and wide, glabrous without except for scattered glands near the teeth, or sparsely floccose and glandular near the teeth and along the ribs, sparsely pubescent within along the teeth, otherwise glabrous, the 5-6 acute teeth 1-1.5 mm long, the bractlet linear, 1-1.5 mm long, fringed with elongated, white to hyaline cells and marginal glands, the pedicel 2.5-4 mm long, glabrous; *flowers* pale yellow with a greenish midrib and base, becoming tinged with pink in some at maturity, 2.5-3 (3.5) mm long, glabrous within and without except for scattered glands along the midribs within, the tepals essentially similar, oblanceolate, 1-1.4 mm wide, the apex emarginate especially in fruit, united less than 1/5 the length of the flower; *stamens* slightly exserted, 3-4 mm long, the filament sparsely pilose basally, the anther pale yellow, 0.5-0.6 mm long, oblong; *achenes* brown, 2.5 mm long, the globose base tapering to a long, 3-angled beak.

TYPE: Among granite rocks near the top of a ridge south of Aneroid Lake near the source of the East Fork of the Wallowa River, Wallowa Mountains, Wallowa Co., Oregon, T.4S., R.45E., sec. 21, at 8500 feet elevation, 5 August 1966, *Holmgren & Reveal 2957*. Holotype: US! Isotypes: BRY, NY, UTC! -- Distributed under the name *Eriogonum chrysops* Rydb.

Eriogonum scopulorum has been included previously under the definition of *E. chrysops* Rydb., a low, desert range species of southeastern Oregon. The exact nature of this species became obvious recently while preparing the description of *E. prociduum* Reveal (in press) which is found in extreme northeastern California and adjacent south-central Oregon. Once the true nature of *E. chrysops* was established, two additional elements came to light as well. These include *E. scopulorum*, as defined here, and a second species, yet to be described, from central Idaho eastward to the Bitterroot Range of the Idaho-Montana state line region. The plants from these high mountain ranges are currently being studied and the results will be presented in 1973.

From *Eriogonum chrysops*, *E. scopulorum* may be quickly distinguished by its glandular scapes and pale yellowish flowers. The scapes of *E. chrysops* are floccose to tomentose and the flowers are a bright yellow. In some respects, *E. scopulorum* is similar to *E. rosense* Nels. & Kenn. of the Sierra Nevada, but the involucre is totally different and the flower color and structure is not the same.

The series of species to which *Eriogonum argophyllum* and *E. scopulorum* belongs is still under study as more isolated species are being discovered; however, a key to the known elements is presented below. All of these entities have a membranaceous involucre tube.

A. Flowers yellow to pale yellow, not white or rose.

B. Scapes glandular; leaves (5) 6-9 (10) mm long, 2.5-4 mm wide, tomentose and glandular on both surfaces; flowers pale yellow, 2.5-3 (3.5) mm long, the tepals oblanceolate; involucre sparsely floccose and glandular or merely glabrous below and slightly pubescent near the teeth, 2.5-3 mm long; Wallowa Mountains, 8500 feet elevation.
..... *E. scopulorum*

BB. Scapes floccose.

C. Flowers bright yellow, 2.5-3 mm long; leaves 1-2 cm long, white-tomentose and eglandular on both surfaces, mostly spatulate, the petiole 2-5 mm long; involucre 3-5 per head, 2.5-3 mm long; low desert ranges in southeastern Oregon mostly below 7000 feet elevation..... *E. chrysops*

CC. Flowers pale yellow; plants of Nevada.

D. Flowers pale yellow, becoming tinged with reddish-brown at maturity in some; leaves densely and evenly tomentose on both surfaces, eglandular, the blade 4-8 mm long, 2-5 mm wide, oblanceolate to elliptic, the petiole 0.5-1 (1.5) mm long and tomentose; involucre 5-7 per head, 2-2.5 mm long; crusted mineralized sand, Sulphur Hot Springs, Ruby Valley, Elko Co., Nevada, at about 6050 feet elevation..... *E. argophyllum*

DD. Flowers greenish-yellow to pale yellow, becoming tinged with red at maturity, 3-3.5 mm long; leaves densely tomentose below, less so and greenish above, eglandular, the blade 5-10 (15) mm long, (2) 3-6 mm wide, oblanceolate to elliptic, the petiole 4-12 (15) mm long; involucre mostly 3-5 per head, 3-3.5 mm long; limestone slopes and ridges, Ruby Mountains and East Humboldt Range, Elko Co., Nevada, from 9000 to 10,400 feet elevation..... *E. kingii*

AA. Flowers white to rose or red, not yellowish.

B. Flowers glandular, not glabrous; plants above 10,000 feet elevation.

C. Leaves 1-2 cm long, densely white-tomentose below, less so and white above; scapes 3-8 cm long, glandu-

lar, not floccose; inflorescences containing 5-7 involucre; pedicels glandular at the tip; granitic sand and rocky outcrops, White Mountains, east-central California and adjacent west-central Nevada, from 10,000 to 13,000 feet elevation.... *E. gracilipes*

CC. Leaves 3-10 mm long, densely white-tomentose and greenish below, less so and greenish above; scapes up to 3 cm long, floccose and glandular; inflorescences containing 2-4 involucre; pedicels glabrous except for a few scattered glands at the base; limestone and quartzite sand and rocky outcrops, Snake Range, east-central Nevada, from 10,000 to 12,000 feet elevation.
..... *E. holmgrenii*

BB. Flowers glabrous, white or cream; leaves mostly spatulate and 1-2 cm long, densely white-tomentose on both surfaces; scapes floccose; inflorescences containing 2-5 involucre; clay slopes and hillsides, Grant and Powell cos., Montana, southwestwardly into Lemhi, Clark and Custer cos., Idaho, below 7000 feet elevation..... *E. mancum*

Eriogonum tumulosum (Barneby) Reveal, stat. nov.

Eriogonum villiflorum A. Gray var. *tumulosum* Barneby, Leaflet. W. Bot. 5:153. 1949.

Low pulvinate caespitose herbaceous perennials with several hundred rosettes of leaves, forming a rounded, hummock-like mound of matted caudex branches and leaves 1-4 dm across, the upper portion of the caudex branches clothed with old persistent leaves and petiole-bases, the lower portion bearing long strips of shaggy brown to reddish-brown bark, from a stout, woody gnarled taproot; leaves clustered, persistent, forming tuft-like rosettes, the leaf-blade oblanceolate to elliptic, 3-4 mm long, 0.7-1 mm wide, white- or greenish- silky-tomentose on both surfaces, the margin entire and plane to slightly thickened, the petiole short, 0.4-0.7 mm long, silky-villous, the petiole-base elongate, 1.2-1.8 mm long, 0.8-1 mm wide, thinly villous without, glabrous within; flowering stems scapose, 1-9 mm long, villous, usually obscured by the leaves, erect; inflorescences capitate, the head 5-8 mm across; bracts 4-5, semifoliateous, linear-lanceolate to lanceolate, 2.5-3.5 mm long, 0.3-0.4 mm wide, villous without, glabrous within, connate at the very base; peduncles lacking; involucre solitary, campanulate, 2-4 mm long, (4) 5-8 mm wide, villous without, glabrous within, the 7-10 lanceolate teeth 1.6-2.2 mm long, the bractlets few, oblanceolate, 2-2.5 mm long, fringed with long white cells, the pedicel short, 0.3-0.5 mm long, sparsely pubescent with scattered villous hairs; flowers white with a greenish or reddish margin, maturing rose or rustic, 3-4 mm long, densely pilose without except for the upper part of the tepals, sparsely pilose within, the tepals essentially similar, oblong to oblong-

oblanceolate, 0.8-1 mm wide, united at least 1/2 the length of the flower; *stamens* slightly exserted, 3-4 mm long, the filament glabrous, the anther reddish-yellow, 0.6-0.8 mm long, oblong; *achenes* light brown, glabrous, 1.8-2 mm long, the globose base tapering to a short, 3-angled beak.

TYPE: Sandstone ledges and rock-pavement on Red Plateau, southwest of Woodside, Emery Co., Utah, at 5200 to 5300 feet elevation, 13 June 1947, *Ripley & Barneby 8678*. Holotype: CAS! Isotypes: GH, NY, UTC!

DISTRIBUTION: Dry sandstone ledges and gravelly clay or rocky places of eastern Utah in Duchesne and Emery cos. Flowering from May to July.

The seemingly close relationship between *Eriogonum villiflorum* and *E. tumulosum* is offset by their very different habit of growth and geographical distribution. Unlike *E. tumulosum* which forms large mounds of several hundred closely associated rosettes of leaves with short, erect scapes topped with a capitate head of involucre, *E. villiflorum* is a small, low, prostrate plant with its ten to twenty loosely associated rosettes bearing a long, prostrate flowering stem topped by a compact umbellate-cyme of involucre. In the field, *E. villiflorum* is very easy to miss, as in most cases it is difficult to distinguish from the array of small rocks it so frequently grows with. *Eriogonum tumulosum*, on the other hand, is very obvious, and the very old, large mounds of dead leaves and detritus often resemble miniature pack-rat nests in the more open places among pinyon-juniper. Their geographical distribution is also distinct. *Eriogonum villiflorum* occurs from White Pine and Lincoln cos., Nevada eastward into western Utah from Beaver and Sevier cos. south to (apparently) Kane Co. where the type was collected but the plant not discovered since. *Eriogonum tumulosum* is found to the east of this range, across the Wasatch Mountains - a physical barrier that reaches elevations of more than 10,000 feet. Its range is from the benches around Duchesne eastward to near Myton in Duchesne Co., and then on the north end of the San Rafael Swells in Emery Co. This type of distribution pattern is seen in other groups, notable in *Astragalus*, *Penstemon* and *Townsendia*.

The three species which belong to this group can be distinguished as follows:

- A. Flowers white, becoming rustic or red in age, 3-4.5 mm long; involucre 6-8-lobed, 5-12-flowered.
- B. Plants loosely caespitose at full development and composed of 10-20 rosettes; flowering stems 2-5 (8) cm long, prostrate; inflorescences compact cymose-umbellate with several evident rays; gravelly and clay soils of western Utah in Beaver, Millard, Sevier and (apparently) Kane cos.

and in Lincoln and White Pine cos. of adjacent eastern Nevada..... *E. villiflorum*

- BB. Plants densely pulvinate and forming hemispheric mounds up to 4 dm across at maturity, with several hundred rosettes; flowering stems 1-9 mm long, erect; inflorescences capitate or essentially so; gravelly and clay soils in eastern Utah from Duchesne Co. south to Emery Co.....
..... *E. tumulosum*

- AA. Flowers yellow, 1.8-2.3 mm long; involucre 4-lobed, solitary, sessile in the rosettes, 3-4-flowered; plants densely pulvinate and compact, 0.2-0.8 cm high; rare, endemic to red calcareous gravel ridges, Paunsagunt Plateau in Red Canyon and near Widtsoe, Garfield Co., Utah..... *E. aretioides*

Eriogonum contiguum (Reveal) Reveal, stat. nov.

Eriogonum inflatum Torr. & Frém. var. *contiguum* Reveal,
Aliso 7:221. 1970.

Erect herbaceous annuals (0.3) 0.5-3 dm high arising from a slender, woody taproot; leaves basal, the leaf-blade mostly round to round-oblong, (0.3) 0.5-1 (1.4) cm long and wide, hirsute on both surfaces, greenish or yellowish, with longer and more numerous hairs along the margin and midvein, usually slightly less pubescent above than below, the margin entire and plane, the apex round, the base usually round, occasionally slightly cordate, the petiole hirsute, 0.4-1.5 cm long, the petiole-base triangular, 0.5-2 mm long, 0.5-1.5 mm wide, hirsute and minutely glandular without, glabrous within; flowering stems erect with 1-few stems, slender, glandular at the base, otherwise glabrous, dark green, up to 5 cm long; inflorescences densely paniculated-cymes, (0.2) 0.5-1.8 dm long, mostly trichotomously (occasionally more) branched at the first node, di- or trichotomous above, the secondary branches lacking or few in number at the first node, the branches slender and dark green, glandular at the nodes and along the lower portion of the branch, otherwise glabrous; bracts scale-like, ternate, triangular, 0.3-1.4 mm long, glandular without, glabrous within except for ciliated hairs at the apex and along the margin of the connate bract, connate at the base; peduncles capillary, ± erect and straight, 0.3-1.2 (2) cm long, glandular at the node, glabrous above, dark green to reddish; involucre turbinate, 1-1.3 mm long, 0.6-1 mm wide, glabrous within and without, the 5 (rarely 4) acute teeth 0.2-0.4 mm long, the bractlet lacking, the pedicel 1-1.6 mm long, glabrous; flowers golden-yellow with dark red to reddish-brown midribs and bases, usually becoming reddish at maturity, 1-1.3 (1.6) mm long, densely and conspicuously short-hirsute without with coarse, whitish-yellow, curved hairs, glabrous within except for minute glands along the midribs, the tepals essentially similar, lanceolate, united about 1/3 the length of the flower; stamens slightly exserted, 0.9-1.2 mm long, the fila-

ments glabrous, the anther yellow, 0.3 mm long, oval; *achenes* light brown, 1.5-1.8 (2) mm long, glabrous, the globose base tapering to a long, 3-angled beak.

TYPE: Large playas southeast of the junction of Nevada 10 and U.S. Highway 95, east of Ash Meadows, T.17S., R.51E., sec. 21, at 2250 feet elevation, Nye Co., Nevada, 3 June 1969, *Reveal & Matthews 2157*. Holotype: US! Isotypes: BRY, NY, UTC!

DISTRIBUTION: Dry desert flats and lower slopes in southwestern Nye Co., Nevada from Ash Meadows south to Pahrump Valley, hence westward into eastern Inyo Co., California from north of Death Valley Junction southward to near Tecopa. Flowering from April to late June.

The elevation of this recently published variety of *Eriogonum inflatum* Torr. & Frém. to the species ranks comes after an additional two years of field work. My early conclusion was based on the supposed strength of the 5-tooth involucre which is so typical of *E. inflatum* and the fact that annuals are a part of the species (ie., var. *fusiforme* of Utah and Colorado). Field work in southern Nevada and adjacent California conducted in the springs of 1970 and 1971 concentrated in those areas where *E. inflatum*, *E. contiguum* and *E. trichopes* Torr. could be found growing together. In these places, all three could be distinguished. Naturally, the line of demarcation between *E. inflatum* and *E. contiguum* was easy to draw, but that between *E. contiguum* and *E. trichopes* was much more difficult. For the most part, the number of teeth on the involucre held, but as more and more plants were studied, it became obvious that an occasional involucre on *E. contiguum* would be four-toothed although the majority of involucres on the same plant had five-teeth. The same held true for *E. trichopes*, with a few plants too having four and five toothed involucres on the same plant.

In the field studies, one aspect was confirmed. In general, *Eriogonum contiguum* is glandular whereas *E. trichopes* is glabrous throughout. Also, the branches of the first species are usually reddish while those of the second species are usually yellowish-green - a feature that can quickly separate the two entities in the field even from a distance. It seems clear from the above investigations, that it is impossible to hold *E. contiguum* within *E. inflatum*, and the only recourse is to elevate it to the specific rank.

The differences between the various species associated with *Eriogonum inflatum* can be separated as follows:

- A. Involucres 5-lobed; plants annual or perennial with an open inflorescence, the lower nodes with 3-5 branches, the upper ones di- or trichotomous; flowers yellow, 1-3 mm long; central

Baja California northward into the western United States.

- B. Plants glabrous and glaucous, annual or perennial, up to 10 dm high; involucre mostly 1-1.5 mm long; flowers 1.5-3 mm long; stems often inflated..... *E. inflatum*
- BB. Plants glandular, strictly annual, up to 3 dm high; involucre 1-1.3 mm long; flowers 1-1.3 (1.6) mm long; stems not inflated..... *E. contiguum*
- AA. Involucres 4-lobed; plants with verticillated whorls at each node, sometimes densely so.
- B. Peduncles 3-15 mm long; leaves pilose to hirsute on both surfaces.
- C. Plants perennial, 2-10 (20) dm high with the inflorescence composed of verticillated cymes of 6-30 radiating, rigid, secondary branchlets; leaves pilose and crispate-undulate; central Baja California..... *E. pilosum*
- CC. Plants annual, 1-4.5 (6) dm high with the inflorescence composed of paniculated cymes with 5-20 radiating secondary branchlets at the lower nodes; leaves hirsute and entire or merely crenulate; northern Baja California and Sonora, Mexico, into the western United States..... *E. trichopes*
- BB. Peduncles lacking or 1-4 mm long; leaves glabrous or short-hirsute on both surfaces.
- C. Plants perennial; peduncles 1-4 mm long; flowers yellowish but becoming reddish, densely hirsute without; leaves glabrous, ciliated; involucre 1.2-1.7 mm long; west-central Baja California. *E. scalare*
- CC. Plants annual; peduncles lacking; flowers white to pink, becoming reddish, strigillose without; leaves short hirsute, not ciliate; involucre 0.4-0.7 mm long; Cedros Island and Vizcaino Desert, Baja California..... *E. intricatum*

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This paper was originally submitted to Dr. Lloyd Shinnars for consideration in *SIDA*. His untimely death delayed publication to a point that the new names would not appear until 1973, too late for their inclusion in the forth coming volume of the *INTERMOUNTAIN FLORA: THE VASCULAR PLANTS OF THE INTERMOUNTAIN WEST* by Cronquist, Holmgren, Holmgren and Reveal. I am grateful to Dr. Shinnars for reviewing the original manuscript and making comments on it.

Field studies were support by National Science Foundation

grants to Arthur Cronquist of the New York Botanical Garden for the Intermountain Flora Project for all species except the last. Field work for studies in Nevada and California during the spring seasons of 1970 and 1971 were fully supported by Contract No. AT (04-1) Gen-12 between the University of California and the Division of Biology and Medicine, United States Atomic Energy Commission; I wish to take this opportunity to thank Dr. Janice C. Beatley, Associate Research Ecologist, for her aid with this work. Additional herbarium and field studies conducted in 1971 and 1972 were largely supported by my National Science Foundation Grant, GB-22645 for studies on *Eriogonum* and the Intermountain Flora.

Lastly I wish to acknowledge the aid of Drs. Noel and Patricia Holmgren of the New York Botanical Gardern for gathering material for me in 1969 and 1970, and Mr. Conrad V. Morton of the Smithsonian Institution for assistance with the Latin descriptions and diagnoses.

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PARMELIA JAMESII, AN UNUSUAL SPECIES IN SECTION IMBRICARIA
(LICHENES) FROM AUSTRALIA AND NEW ZEALAND

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Parmelia jamesii, sp. nov.

Thallus adnatus, corticola, mollis, cinereo-albus, 5-10 cm latus, lobis sublinearibus, 1.5-3.0 mm latis, margine sparse ciliatis, superne planus, nitidus vel sparse opacus pruinosisque, aetate rugosus, apicem versus leviter albo-reticulatus, modice isidiatus, isidiis cylindricis, tenuibus, erectis, usque ad 0.3 mm altis, subtus niger, modice rhizinosus, rhizinis simplicibus vel paucae squarrose furcatis. Apothecia ignota.

Chemistry: Atranorin in the cortex, fumarprotocetraric acid and protocetraric acid (trace) in the medulla (identified with thin-layer chromatography).

Holotype: On Nothofagus by the coast, Wellington, North Island, New Zealand, collected by P. W. James, NZ2118, January 1963 (US; isotypes in BM, TNS).

Additional specimen examined: South side of Monga Mountain, Braidwood Distr., N.S.W., Australia, Weber & McVean L-51532 (COLO, US).

The distinguishing features of this species are the isidia, unusual development of rhizines, and chemistry, this being one of the very few species in subgenus Parmelia with fumarprotocetraric acid. Superficially the species seems to belong in section Hypotrachyna because of the sublinear narrow lobes, much as in P. imbricatula, but the rhizines are not dichotomously branched. While the rhizines are mostly simple, some have distinct short side branches typical of squarrosely branched species in section Parmelia, where, in fact, I had tentatively placed the species, in spite of the fairly obvious marginal cilia. I concluded that P. jamesii is best assigned to section Imbricaria on the basis of the fine structure of the surface of the cortex. There are numerous pores at X500 under the scanning electron microscope such as one would expect to find in section Imbricaria. No pores are produced in section Parmelia.

NOVELTIES FROM BRAZIL, PERU, VENEZUELA, AND THAILAND

Harold N. Moldenke

CITHAREXYLUM FLEXUOSUM var. *GLABERRIMUM* Moldenke, var. nov.

Haec varietas a forma typica speciei foliis utrinque glaberrimis nitidisque differt.

This variety differs from the typical form of the species in having both surfaces of its leaf-blades completely glabrous and shiny.

The type of the variety was collected by C. Earle Smith, Jr., and Jacinto Blas (no. 4905) along the trail to the cave across the Río Santo from Mancos, Callejon de Huaylas, Ancash, Peru, on April 9, 1970, and is deposited in the United States National Herbarium at Washington. The collectors describe the plant as a closely branched shrub to 2 meters tall, the fruit being shiny and black.

CLERODENDRUM SCHMIDTII var. *MACROPHYLLUM* Moldenke, var. nov.

Haec varietas a forma typica speciei laminis foliorum 25--28 cm. longis 13--14.5 cm. latis et petiolis 8--13 cm. longis recedit.

This variety differs from the typical form of the species in having its petioles 8--13 cm. long and the leaf-blades 25--28 cm. long and 13--14.5 cm. wide.

The type of the variety was collected by Ch. Charoenphol, Kai Larsen, and E. Warncke (no. 5022) at Ko Rang Yai, 20 km. south of Ko Chang, in southeastern Thailand, 11°48' N., 102°23' E., on November 19, 1970, and is deposited in the Herbarium Jutlandicum of the Botanisk Institut, Aarhus Universitet, Aarhus, Denmark. The collectors describe the calyx as "whitish green with a little red" and the corollas as white.

LANTANA ARMATA var. *VELUTINA* Moldenke, var. nov.

Haec varietas a forma typica speciei laminis foliorum subtus petiolisque pedunculisque ramulisque sarmentisque ubique densissime breviterque velutinoso-pubescentibus recedit.

This variety differs from the typical form of the species in the lower surface of its leaf-blades, its petioles, its peduncles, branchlets, and twigs very densely velutinous-pubescent with very short and soft hairs, not at all hirsute nor hispidulous.

The type of the variety was collected by Santiago López-Palacios (no. 2616) at El Rincón, near Ureña, Táchira, Venezuela, on December 8, 1971, and is deposited in my personal herbarium at Plainfield, New Jersey. The collector notes "Arbusto aparentemente inerme, hojas ovales a oval-lanceoladas, membranáceas, un poco ásperas por la haz cuando secas, velutinosas por el envés. Pedúnculos por lo general menores que las hojas. Brácteas pequeñ-

as, lineal lanceoladas. Flores amarillas que cambian a anaranjado."

PAEPALANTHUS DICHOTOMUS var. *BRASILIENSIS* Moldenke, var. nov.

Haec varietas a forma typica speciei foliis 3—5 mm. longis 1 mm. latis glabris nitidisque ad apicem acutissimis et pedunculis abbreviatis 4—10 mm. longis recedit.

This variety differs from the typical form of the species in having its rosulate leaves only 3—5 mm. long and 1 mm. wide, thick in texture, stiffly erect, glabrous and shiny, very acute at the apex, and the peduncles much abbreviated, only 4—10 mm. long.

The type of the variety was collected by Gert Hatschbach (no. 27425) along the road near Salto da Divisa, in the municipality of Diamantina, Minas Gerais, Brazil, at 1300 meters altitude, on September 7, 1971, and is deposited in my personal herbarium at Plainfield, New Jersey.

ADDITIONAL NOTES ON THE GENUS VERBENA. X

Harold N. Moldenke

VERBENA [Dorst.] L.

Additional & emended bibliography: Gattinger, Med. Pl. Tenn. 63—64. 1894; Reiche & Phil., Fl. Chil. 5: 271—298, 300, 302, 304, & 463. 1910; Graves, Eames, Bissell, Andrews, Harger, & Weatherby, Bull. Conn. Geol. & Nat. Hist. Surv. 14: [Cat. Flow. Pl.] 330—332. 1910; Harger, Bull. Conn. Geol. & Nat. Hist. Surv. 48: 74. 1930; Gathercoal, Checklist Nat. & Introd. Drug Pl. [22]. 1942; Beston, Herbs & Earth 60—62, 131, & 133. 1950; Goossens, Suid-Afrik. Elom. Pl. 185. 1953; Fogg, Weeds Lawn & Gard. 141. 1956; Haramaki, Weed Abstr. 14: 256. 1965; Ferrándiz, Guia Med. Veg. 388—389. 1967; Tawada, Okinawa Seibutsugakki [Biol. Mag. Okinawa] 4 (6): 36. 1968; McCarthy & Morrow, Proc. 24th N. Cent. Weed Control Conf. 64. 1969; Soukup, Raymondiana 3: 26, 57, & 91. 1970; Graf, Exot. Pl. Man., ed. 1, 320, 378, 410, & 411. 1970; Bright of America, Summersville, W. Va., 25.GC.70 Petunias & Verbenas. 1970; Kayall, Weed Abstr. 20: 321. 1971; Moldenke, Fifth Summ. 1: 6, 10, 14—25, 27, 30—54, 57—66, 74—78, 81, 82, 84—86, 89, 91, 92, 98, 99, 101, 104—106, 109, 111, 120, 128, 137, 138, 143, 144, 177—179, 184, 187—190, 192—194, 200—211, 213—215, 222, 231, 234, 238, 241, 246, 248, 252, 255, 257, 262, 264—267, 269—271, 278, 279, 281, 284, 290, 292, 294, 298, 303, 306, 308, 311—313, 318, 328, 337, 341, 343, 344, 349—353, 369—373, 375, 376, 389—391, 396, 397, 400, 402, 421, 468, 471, & 473 (1971) and 2: 491, 492, 520—523, 525—527, 531, 534, 548, 558, 559, 568, 569, 575, 593, 594, 618—621, 645, 648—710, 736, 738, 741, 742, 744, 752, 766, 767, 769,

773, 774, 776, 781--785, 787, 780, 791--794, 912--922, 967--970, & 973. 1971; Moldenke, *Phytologia* 22: 456--501. 506--508, 510, & 512. 1972.

VERBENA AMBROSIFOLIA Rydb.

Additional bibliography: Moldenke, *Phytologia* 22: 459--462, 471, 473, 485, & 497. 1972.

VERBENA ARAUCANA R. A. Phil.

Additional & emended bibliography: Reiche & Phil., *Fl. Chil.* 5: 289 & 290. 1910; Moldenke, *Phytologia* 22: 463 & 464. 1972.

VERBENA ARISTIGERA S. Moore

Additional bibliography: Moldenke, *Phytologia* 22: 463--464. 1972.

The corollas of this plant are described as "lilac" on Krapovickas & Cristóbal 16015.

Additional citations: ARGENTINA: Misiones: Krapovickas & Cristóbal 16015 (Ft).

VERBENA ATACAMENSIS Reiche

Additional & emended bibliography: Reiche & Phil., *Fl. Chil.* 5: 289 & 291--292. 1910; Moldenke, *Phytologia* 22: 464. 1972.

VERBENA BERTERII (Meisn.) Schau.

Additional bibliography: Reiche & Phil., *Fl. Chil.* 5: 287, 289, 293, & 294. 1910; Moldenke, *Phytologia* 22: 466. 1972.

VERBENA BONARIENSIS L.

Additional & emended bibliography: Reiche & Phil., *Fl. Chil.* 5: 283 & 284. 1910; Moldenke, *Phytologia* 22: 474--479. 1972.

VERBENA BRASILIENSIS Vell.

Additional bibliography: Rickett, *Wild Fls. U. S.* 3 (2): [367], pl. 111 (1969) and 5 (2): [455], pl. 152. 1971; Moldenke, *Phytologia* 22: 478 & 488--490. 1972.

Additional illustrations: Rickett, *Wild Fls. U. S.* 3 (2): [367], pl. 111 (in color) [as V. litoralis] (1969) and 5 (2): [455], pl. 152 (in color) [as V. litoralis]. 1971.

Rickett (1969, 1971), in the color illustration which he uses twice, purports to depict V. bonariensis L. and V. litoralis H.B.K. -- the front plant in the photograph is obviously V. bonariensis, but the rear plant is certainly not V. litoralis! A far more likely identification for it is V. brasiliensis.

VERBENA CABRERAE Moldenke

Additional synonymy: Glandularia cabreræ (Mold.) Tronc., in herb.

Additional bibliography: Moldenke, *Phytologia* 22: 490. 1972.

Krapovickas and his associates found this plant growing on "barrancas de arroyo" and describe the corollas as "violet".

Additional citations: BOLIVIA: Tarija: Krapovickas, Mroginski, & Fernández 19272 (Ft.).

VERBENA CANADENSIS (L.) Britton

Additional & emended bibliography: Graves, Eames, Bissell, Andrews, Harger, & Weatherby, Bull. Conn. Geol. & Nat. Hist. Surv. 14: [Cat. Flow. Pl.] 331—332. 1910; Winge, Proc. Linn. Soc. Lond. 150: 236. 1938; Moldenke, Phytologia 22: 492—498. 1972.

VERBENA CAROLINA L.

Additional synonymy: Verbena caroliniana Anderss. apud B. L. Robinson, Proc. Am. Acad. 38: 197, in syn. 1902.

Additional & emended bibliography: Crantz, Inst. Rei Herb. 1: 573. 1766; [Retz.], Nom. Bot. 11. 1772; J. F. Gmel. in L., Syst. Nat., ed. 13, pr. 1, 2: 42 (1789) and ed. 13, pr. 2, 2: 42. 1796; Pers., Sp. Pl. 3: 347. 1819; Hook., Trans. Linn. Soc. Lond. Bot. 20: 195. 1847; A. Wood, Class-book, [ed. 42], pr. 1, 537 (1861), [ed. 42], pr. 2, 537 (1863), [ed. 42], pr. 3, 537 (1865), [ed. 42], pr. 4, 537 (1867), [ed. 42], pr. 5, 537 (1868), [ed. 42], pr. 6, 537 (1869), and [ed. 42], pr. 7, 537. 1870; A. Wood, Am. Bot. & Flor., ed. 1, pr. 1, 236 (1870), ed. 1, pr. 2, 236 (1871), and ed. 1, pr. 3, 236. 1872; A. Wood, Class-book, [ed. 42], pr. 8, 537. 1872; A. Wood, Am. Bot. & Flor., ed. 1, pr. 4, 236 (1873), ed. 1, pr. 5, 236 (1874), and ed. 1, pr. 6, 236. 1875; A. Wood, Class-book, [ed. 42], pr. 9, 537 (1876) and [ed. 42], pr. 10, 537. 1881; O. R. Willis in A. Wood, Am. Bot. & Flor., ed. 2, 236. 1889; Solered., Syst. Anat. Dicot. 713. 1899; B. L. Robinson, Proc. Am. Acad. 38: 196—197. 1902; D. H. Scott in Solered., Syst. Anat. Dicot., transl. Boodle & Fritsch, 1: 631. 1908; Lowe, Miss. State Geol. Surv. Bull. 17: 236. 1921; Savage, Cat. Linn. Herb. Lond. 4. 1945; Howell & McClintock in Kearney & Peebles, Ariz. Fl., ed. 2, 726 & 727. 1960; J. F. Macbr., Field Mus. Publ. Bot. 13 (5): 615, 618, & 624. 1960; Hocking, Excerpt. Bot. A.6: 91 (1963) and A.7: 206 & 455. 1964; Rzedowski & McVaugh, Contrib. Univ. Mich. Herb. 9: 65 & 107. 1966; W. C. Grimm, Recog. Flow. Wild Pl. 228 & 229. 1968; Moldenke, Biol. Abstr. 49: 3252. 1968; Moldenke, Phytologia 16: 186 & 340—341. 1968; Moldenke, Résumé Suppl. 16: 2 & 28. 1968; Hocking, Excerpt. Bot. A.13: 570 & 571 (1968) and A. 14: 206. 1969; Moldenke, Biol. Abstr. 50: 418. 1969; D'Arcy, Taxon 19: 556. 1970; Gibson, Fieldiana Bot. 24 (9): 230—232, fig. 46. 1970; Wiggins & Porter, Fl. Galáp. Isls. 997. 1971; Moldenke in Wiggins & Porter, Fl. Galáp. Isls. 508. 1971; Moldenke, Fifth Summ. 1: 51, 63, 75, 81, 84, 85, & 370 (1971) and 2: 654, 660, 661, 673, 684, 690, 701, 706, 709, 787, 793, 913, & 973. 1971; Moldenke, Phytologia 22: 501—502. 1972.

Additional illustrations: Gibson, Fieldiana Bot. 24 (9): 231, fig. 46. 1970.

Recent collectors have found this plant growing along streams, along paths in open disturbed secondgrowth thickets, and along dry open or dry grassy roadsides, on railroad embankments and grassy valley floors, in matorral, deciduous tropical woods, dense

forests, small barrancas, maize fields, disturbed oak woods, pine-woods, pine-fir woods, and pine-oak woods, often in rocky soil. It has been collected in fruit in March (in addition to the months previously reported). Additional common names reported for it are "chichavac" and "dorí". Pennington reports that it is an excellent pasturage plant and that a medicinal tea is made from it in Sonora to cure headaches.

The corollas are described as "lilac" on Flores Crespo 293, "violet" on Franco R. s.n. [20.VIII.1967], "pale-violet" on Roe, Roe, & Mori 678, "blue" on Breedlove 14430a, Jiménez R. 151, and S. López 89, "light-blue" on Rowell 3061, "pale-blue" on Flores Crespo 45 and Breedlove & Kawahara 16887, and "purple" on Bautista s.n. [13/VIII/1967], Farías 83, Martínez-Calderón 1765, R. Runyon 884, and J. Rzedowski 1135, 1226, 20284, & 20988.

Breedlove & Kawahara found the plant growing on the wooded banks of streams with Alnus sp., Quercus spp., Padus serotina, and Pinus engelmanni. In Guanajuato McVaugh found it "on steep rocky (rhyolitic) mountainsides, weedy, not much seen", but in Tamaulipas it is reported by Runyon as "common on tops of mountains in fertile soils". Rzedowski encountered it in "charcos cercanos a la carretera", González Quintero in "ladera caliza con vegetación de Cephalocereus", and Jiménez R. on "ladera con vegetación de matorral xerófilo".

Gibson (1970) states that "This has been reported from Guatemala as V. ehrenbergiana Schauer". Macbride (1960) cites Pennell 14770 from Lima and Soukup 3182 from Junín, Peru, but these are probably misidentifications. The "Verbena Carolina L." of Lowe (1921) is Stylodon carneus (Medic.) Moldenke, as is also the "Verbena caroliniana, Carolina verbena" described by Grimm (1968).

Savage (1945) lists as the type of V. carolina sheet 17 under genus 35, Verbena, where it is identified as "Verbena 'carolin.'" with the comment "[cf. Jacq. list 1761. n. 8. det. Jacq: an carolina]".

Franco R. s.n. [20.VIII.1967], García Romero s.n. [11.VIII. 1968], and Márquez s.n. [23/VII/1962] are mixtures with V. menthaefolia Benth., while Pennington 215 is a mixture with V. pincetorum Moldenke.

Charles Darwin, in the beginning of October, 1835, on the famous voyage of the "Beagle", collected two specimens of vervain on James Island in the Galápagos group. One of these was identified by Hooker on the label as "Verbena polystachya H.B.K. var.?" Later (1847) he published this as "V. polystachya H.B.K. var. foliis incis segmentis grossè serratis" and made this comment: "Sprengel unites this species with V. urticaefolia, to which our plant bears a close affinity; but the margins of the leaves in the present are far more deeply cut, and the segments again coarsely serrated. They may very possibly be mere variations of one species." Andersson (1859) misquoted Hooker's varietal description

and reduced it to "V. caroliniana Linn." Robinson (1902) and Stewart (1911) adopted the name, V. carolina L., for the plant of Darwin. There is no evidence that any of these later workers actually examined Darwin's specimen, although an unknown hand changed the determination on it to "V. urticifolia L. ?" and then to "V. carolina L." Examination of the original specimen has shown that it represents neither of the suggested species, but is actually V. sedula var. darwinii Moldenke.

The Hodge 6237, distributed as V. carolina, is actually V. hayekii Moldenke, while Bunting & Licht 976, Díaz Luna 460, and Tyson, Dwyer, & Blum 4300 are V. litoralis H.B.K.

Additional citations: ARIZONA: Santa Cruz Co.: Mason, Drouet, MacEwan, & Price 1808 (Mi). MEXICO: Chiapas: Breedlove 14430a (Mi). Federal District: Aguirre Z. 121 (Ip); Carrillo 42 (Ip); J. Espinosa s.n. [X.1954] (Ip); Farías R. 89 (Ip); Gutiérrez & Molina s.n. [1.X.1967] (Ip); Islas F. s.n. [23/III/1962] (Ip); Jiménez R. 151 (Ip); S. López 89 (Mi); Márquez s.n. [23/VII/1962], in part (Ip); Rojano 18 (Ip), 83 (Ip); J. Rzedowski 1135 (Ip), 1226 (Ip). Guanajuato: R. McVaugh 24206 (Mi). Guerrero: Rowell 3061 (Mi). Hidalgo: González Quintero 1207 (Ip). Jalisco: Díaz Luna 209 (Mi); Harker & Mellowes 35 (Ip, Mi). México: Armenta 28 (Ac); Franco R. s.n. [20.VIII.1967], in part (Ip); González Quintero 1178 (Ip); Pineda R. 359 (Rf); Ryesky 101 (Ws), 102 (Ws); J. Rzedowski 20284 (Rf); Salinas M. 85 (Ac); Villegas D. 76 (Ip). Michoacán: Bautista s.n. [13/VIII/1967] (Ip); García Romero s.n. [11.VIII.1968], in part (Ip); Hinton 13022 (Se--117448). Morelos: Flores Crespo 45 (Rf), 293 (Ac); Guerrero O. s.n. [14/IX/1962] (Ip); H. Hernández s.n. [12/VII/1965] (Ac). Nuevo León: Barkley & Alanís 41012 (Go, Rf). Oaxaca: J. Rzedowski 20988 (Ac); C. L. Smith 224 (Ip). Puebla: González Quintero 180 (Ip). Sinaloa: Breedlove & Kawahara 16887 (Rf). Sonora: Pennington 215, in part (Au--264202). Tamaulipas: R. Runyon 884 (Au--268204). Veracruz: Martínez Calderón 1765 (Rf). GUATEMALA: Quezaltenango: Roe, Roe, & Mori 678 (Rf). HONDURAS: Copán: F. A. Barkley 40267 (Rf). EL SALVADOR: San Salvador: C. Garcia 135 (Ca--1284417).

VERBENA CAROLINA f. ALBIFLORA Moldenke

Additional bibliography: Hocking, Excerpt. Bot. A.13: 570 & 571. 1968; Moldenke, Résumé Suppl. 16: 2. 1968; Moldenke, Phytologia 16: 88. 1968; Moldenke, Biol. Abstr. 49: 3252. 1968; Moldenke, Fifth Summ. 1: 75, 81, 84, & 85 (1971) and 2: 674, 688, & 913. 1971.

Recent collectors have encountered this plant in villages and at the edge of deciduous woods, flowering and fruiting in May. Material has been misidentified and distributed in some herbaria

as V. officinalis L.

Additional citations: MEXICO: Veracruz: Gutiérrez R. 342 (Rf).
GUATEMALA: El Quiché: E. Contreras 5247 (W—2558708).

VERBENA CATHARINAE Moldenke

Synonymy: Verbena catharinensis Moldenke, Fifth Summ. 2: 661, in syn. 1971.

Additional bibliography: Angely, Fl. Anal. Paran., ed. 1, 571. 1965; Moldenke, Phytologia 11: 451--452. 1965; Moldenke, Fifth Summ. 1: 177 (1971) and 2: 661 & 913. 1971.

Hatschbach describes this plant as creeping and rooting, the corollas violet or intensely lilac in color, blooming in October.

Additional citations: BRAZIL: Paraná: Hatschbach 14968 (Mi), 22644 (Mi, N).

VERBENA CHACENSIS Moldenke

Additional bibliography: Moldenke, Phytologia 10: 101. 1964; Moldenke, Fifth Summ. 1: 187 (1971) and 2: 913. 1971.

VERBENA CHEITMANIANA Moldenke

Synonymy: Glandularia cheitmaniana Schnack & Rubens, Bol. Soc. Argent. Bot. 13: 205, hyponym. 1970.

Additional bibliography: Moldenke, Phytologia 13: 188. 1966; Schnack & Rubens, Bol. Soc. Argent. Bot. 13: 205. 1970; Moldenke, Fifth Summ. 1: 200 & 370 (1971) and 2: 913. 1971.

The Ritchie specimen cited below is a mixture with V. rigida Spreng. It is accompanied by a longhand label which I am unable to decipher, but which appears to be only a diagnostic description of the plants. There does not seem to be any indication that the specimens were taken from wild plants, so I assume that they were cultivated where collected.

Additional citations: CULTIVATED: India: C. Ritchie 57, in part (Ed).

VERBENA CHILENSIS Moldenke, Known Geogr. Distrib. Verbenac., ed. 1, 78. 1942.

Additional bibliography: Moldenke, Phytologia 16: 88. 1968; Moldenke, Fifth Summ. 1: 200 (1971) and 2: 671, 776, & 913. 1971.

Bartlett found this plant growing on a mountain ridge above the barrel cactus zone.

Additional citations: ARGENTINA: Mendoza: H. H. Bartlett 19410 (Au—195085, N). Neuquen: O'Donell 2008 (N).

VERBENA CILIATA Benth.

Additional synonymy: Verbena cilliata Benth. ex Moldenke, Résumé Suppl. 18: 14, in syn. 1969. Verbina ciliata Benth. ex Moldenke, Fifth Summ. 2: 708, in syn. 1971.

Additional & emended bibliography: Rydb., Fl. Rocky Mtns., ed. 2, pr. 1, 739 & 740 (1922) and ed. 2, pr. 2, 739 & 740. 1954; Howell & McClintock in Kearney & Peebles, Ariz. Fl., ed. 2, 725 & 727. 1960; Martin & Barkley, Seed Ident. Man. 194. 1961; Turrill

in Curtis, Bot. Mag. 174: pl. 409. 1963; Hocking, Excerpt. Bot. A.6: 91. 1963; Marroquin, Cuad. Inst. Invest. Cient. 14: 30 & 56. 1968; Moldenke, Phytologia 16: 186 & 196. 1968; Moldenke, Résumé Suppl. 17: 2 (1968) and 18: 14. 1969; Gilbertson & McHenry, Univ. Ariz. Agr. Exp. Sta. Tech. Bull. 186: 7 & 39. 1969; Hafez & Younis, Physiol. Pl. 22: 332. 1969; Kapp, How to Know Pollen 104, 135, 231, & 249, fig. 208 & 276. 1969; Rydb., Fl. Rocky Mtns., ed. 2, pr. 3, 739 & 740. 1969; Rickett, Wild Fls. U. S. 3 (2): [361] & 362, pl. 109 (1969) and 4: 539, [541], & 799, pl. 176. 1970; Jarrett, Ariz. Highways 47 (8): [11] & 38. 1971; Moldenke in Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. Bot. 6:] 1317 & 1325. 1970; Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. Bot. 6:] 1799, 1876, & 1877. 1970; Moldenke, Fifth Summ. 1: 39, 42, 53, 58, 61, 63, 65, 75, 78, 81, & 370 (1971) and 2: 659, 663, 667, 708, 767, & 913. 1971; Moldenke, Phytologia 22: 461, 462, 473, & 497. 1972.

Additional illustrations: Rickett, Wild Fls. U. S. 3 (2): [361], pl. 109 (in color) (1969) and 4: [541], pl. 176 (in color). 1970; Jarrett, Ariz. Highways 47 (8): [11] (in color). 1971.

The seeds of this plant are said by Martin & Barkley (1961) to be compressed-oblong and slightly rounded-triangular in cross-section, making them somewhat 2-sided, the rounded back bearing lengthwise ridges toward the lower end and a network of cross-ridges below, the inner face of the two planes meeting in a low ridge, the surface generally covered with whitish papillae, the margin bordered by a narrow flange, the attachment-scar whitish and surrounded by a cuplike extension, the entire seed 1.5—3 mm. long, with no endosperm.

Recent collectors have found this species growing on dry plains and mesas, dry desert plains, flat dry plains, and low banks near water, among large rocks, along dry roadsides, in xerophytic matorral, "pastizales", "zacatal", matorral with Opuntia, maize fields, and Quercus-Cupressus woods, in openings in pine forests, subalpine meadows, Prosopis-Larrea scrub, dry level rocky grasslands, open stony roadside pastures, and matorral roadsides, in sandy, volcanic, or rocky limestone soil. In addition to the months previously recorded, it has been found in anthesis in January.

The Andersons found V. ciliata "locally common in small barrancas with vegetation of shrubs, cacti, and a few small trees, with limestone rocks, in Puebla and among shrubby vegetation in arroyos, abundant by roads, in Guanajuato; García Saucedo found it in xerophilous matorral with Opuntia and Agave in Hidalgo; while Stuessy encountered only "one clump about 4 feet in diameter in Acacia grassland in Chihuahua. Cruz Cisneros found it on "ladera andesítica con vegetación de pastizal con Quercus, Opuntia y Leguminosae", "ladera andesítica con vegetación xerófita", and "ladera basáltica con vegetación de matorral de Acacia y Opuntia".

The corollas are described as having been "lilac" on Asteinza s.n. [5.VII.1966], Íñiguez 74, and Villegas D. 388, "blue" on Pi-

neda R. 348, "violet" on Latotre s.n. [12 May 1968], "lavender-purple" on Dieterle 3575, "lavender" on Anderson & Anderson 5048 and Anderson & Laskowski 3548, "blue-purple" on Stuessy 959, "reddish" on McGregor 16626, "pinkish-purple" on Vilas 39, "reddish-violet" on Vilas 29, "lavender, turning rose-pink in press" on Anderson & Anderson 5314, and "purple" on Dominguez & McCart 8270, Galicia 17, García Saucedo 2607, Hidalgo & Anda s.n. [27.IV. 1967], Nevling & Gómez-Pompa 1075, Powell, Scudday, & Sikes 1434, J. Rzedowski 3051, 3428, 20301, 20543, 22205a, & 23895, and Ventura A. 1545.

Gilberson & McHenry (1969) report that this plant is attacked by both the pycnia and aecia stages of the fungus, Puccinia aristidae Tracy, in Yavapai County, Arizona. Marroquin (1968) cites Alanís 124, 258, & 278 (FCB 2490, 2491, & 2492) and Gutiérrez Lobatos 144 (FCB 1353) from Nuevo León, Mexico.

Mutis 1919, cited below, bears a printed label reading "PLANTS OF COLOMBIA", but the specimen was undoubtedly collected in Mexico. J. Rzedowski 22205a is a mixture with V. menthaefolia Benth. The color illustration purporting to represent V. ciliata in the Rickett publications (1969, 1970) seems definitely to be not this species.

Material of V. ciliata has been misidentified and distributed in herbaria under the names V. ambrosaeifolia Rydb. and V. microphylla H.B.K. On the other hand, the J. H. Ehlers 8367, distributed as V. ciliata, is actually V. ambrosifolia Rydb.; Demaree 41126, Hinton & al. 17130, and Mears & Mears 1815 are V. ambrosifolia f. eglandulosa Perry; Hargrove & Tilton HT.500677 is V. bipinnatifida Nutt.; Hargrove & Tilton HT.500652 is V. bracteata Lag. & Rodr.; Ramírez & Cárdenas 13 is V. ciliata var. longidentata Perry; Beasley & Finzel 851 is V. ciliata var. pubera (Greene) Perry; Atwood 1730, C. L. Hitchcock 25540 & 25614, and Munz, Johnson, & Harwood 4254 are V. gooddingii Briq.; Pinkava, Lewis, Noble, & Lehto 11249 is V. gooddingii var. nepetifolia Tidestr.; Pruitt 210 and B. C. Tharp 49-1118 are V. pumila Rydb.; and Barkley, Paxson, & Webster 2493, Rebolledo Vélez s.n. [20. VIII.1967], and J. Rzedowski 1009 are V. teucriffolia Mart. & Gal.

Additional citations: MEXICO: Chihuahua: Stuessy 959 (Au--257767), 965 (Au--257701), 1014 (Au--257670). Coahuila: Johnson & Johnson 1649 (Ws); Latotre s.n. [12 May 1968] (Au--265045); Powell, Scudday, & Sikes 1434 (Au--257010). Durango: Anderson & Laskowski 3548 (Mi); Johnson & Johnson 1712 (Ws). Federal District: Bopp 214 (Ip). Guanajuato: Anderson & Anderson 5048 (Mi). Hidalgo: García Saucedo 2607 (Rf); González Quintero 349 (Au--241298); J. Rzedowski 16927 (Ip), 20543 (Ac), 23895 (Rf); S. Sánchez 37 (Ac). Jalisco: J. V. A. Dieterle 3575 (Mi); R. L. Mc

Gregor 16626 (N). México: Asteinza s.n. [5.VII.1966] (Ip); Cruz Cisneros 499 (Mi), 524 (Ip), 562 (Mi); E. R. García 60 (Rf); Hidalgo y Anda s.n. [27.IV.1967] (Ip); Iñiguez 74 (Ac); M. Padilla 117 (Ac); Pineda R. 348 (Rf); Rebolledo Vélez s.n. [20.VIII.1967] (Ip); J. Rzedowski 15678 (Ip), 20301 (Ip), 22205a, in part (Ip), 22206a (Ip); Vargas N. 49 (Rf); Villegas D. 368 (Ip), 388 (Ip). Nuevo León: Dominguez & McCart 8270 (Au—222192); L. Gilbert 63 (Au—252409); H. Hernández s.n. [21/V/1965] (Ip). Oaxaca: Vilas 29 (Ws), 39 (Ws). Puebla: Anderson & Anderson 5314 (Mi); Guerra M. 16 (Ac); Long & Burch 3321 (N); Manning & Manning 53719 (Au—234068); Ventura A. 1545 (Mi). San Luis Potosí: J. Rzedowski 3051 (Ip), 3428 (Ip). Tamaulipas: Serna 34 (Lk). Tlaxcala: Galicia 17 (Ip—2264, Ip). Veracruz: Nevling & Gómez-Pompa 1075 (G). State undetermined: Mutis 1919 (W—1562721); Schnée s.n. [VII—XII] (Mi).

VERBENA CILIATA var. LONGIDENTATA Perry

Additional synonymy: Verbena ciliata longidentata Perry apud Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. Bot. 6:] 1876. 1970.

Additional bibliography: Moldenke, Phytologia 16: 88. 1968; Kapp, How Know Pollen 104, 135, & 231, fig. 208 & 276. 1969; Moldenke in Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. Bot. 6:] 1217 & 1325. 1970; Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. Bot. 6:] 1876. 1970; Moldenke, Fifth Summ. 1: 58, 62, & 75 (1971) and 2: 663 & 913. 1971; Moldenke, Phytologia 22: 462, 473, & 497. 1972.

Additional illustrations: Kapp, How Know Pollen 104 & 135, fig. 208 & 276. 1969.

Runyon describes this plant as an annual, 1 foot tall, its leaves petiolate or subsessile, cuneate-lanceolate in outline, deeply incised or lobed and dissected, the bark green, the roots fibrous, the flowers odorless, and the fruit a "cylindric capsule" [it is actually a schizocarp]. It has been collected at altitudes from sealevel to 2400 feet. In addition to the months previously reported, it has been collected in anthesis and fruit in January and September. The corollas are described as "blue" on R. Runyon 2497, "violet-purple" on R. Runyon 2361, "rose-purple" on R. Runyon 2495, and "purple" on B. Hutchins 318, C. L. Lundell 10656, and R. Runyon 1576 & 1577. Recent collectors have found it growing in black heavy soil, sandy soil over limestone, and sand along roadsides. Hutchins found it "in calcareous clay loam of barditch" and his specimen is accompanied by a photograph of the plant in situ. Cory found it to be "infrequent in grassland of roadsides" in San Patricio County, Texas. Runyon avers that it blooms from February to April in Cameron County, where it is "a very common verbena covering large patches and producing flowers in abundance, forming large patches in early spring", although for his no. 2495 he notes "occasional in open ground".

Cumbie 53 bears a notation that it is a voucher for anatomical studies; it was misidentified as V. bipinnatifida Nutt., so the anatomical studies, if they have been published, are probably incorrectly said to refer to that species.

Material of V. ciliata var. longidentata has also been misidentified and distributed in some herbaria under the names V. ambrosifolia eglandulosa Perry and V. cloveri var. lilacina Moldenke. On the other hand, the Demaree 7685, distributed as V. ciliata var. longidentata, seems to be var. pubera (Greene) Perry instead.

Additional citations: TEXAS: Bexar Co.: McCullough 6 (N). Cameron Co.: C. L. Lundell 10656 (N); R. Runyon 1576 (Au--269653), 1577 (Au--269654), 2361 (Au--268823), 2495 (Au--268726, Au--269652, N, N), 2497 (Au--268720). Fayette Co.: Ripple 51-580 (Au--226865). Garza Co.: B. Hutchins 319 (Lk). Kent Co.: Cumbie 53 (Lk). Kinney Co.: Strother 263 (Au--238209). San Patricio Co.: Cory 51256 (Mi). Webb Co.: Barrera & Laurel 59 (Lk). Wichita Co.: Whitehouse 9513 (N). Zapata Co.: Novoa & Cantu 18a (Au--245164, Ip). Zavala Co.: Ramirez & Cardenas 13 (Au--245214). MEXICO: Coahuila: G. A. Voss 486 (Sd--63759).

VERBENA CILIATA var. PUBERA (Greene) Perry

Additional bibliography: Howell & McClintock in Kearney & Peebles, Ariz. Fl., ed. 2, 727. 1960; Moldenke, Phytologia 16: 88-89. 1968; Moldenke in Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. Bot. 6:] 1317 & 1325. 1970; Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. Bot. 6:] 1876. 1970; Moldenke, Fifth Summ. 1: 51, 58, 62, 63, & 65 (1971) and 2: 522, 663, 691, & 913. 1971.

Recent collectors have found this plant growing in rocky sandy loam, shallow alkaline soil, gravelly sand of Acacia-Yucca-grass communities, and along railroad tracks. Howell & McClintock (1960) describe the plant as "more prostrate and compact and more revolute leaf margins" and maintain that it is found "throughout the range of the species" in Arizona.

The M. Winter 61, distributed as V. ciliata var. pubera, is actually V. pumila Rydb.

Additional citations: TEXAS: Bailey Co.: Rosson 506c (Lk). Garza Co.: B. Jensen 8 (Au--24801). Jeff Davis Co.: Small & Wherry 12072 (Id). Lubbock Co.: Demaree 7685 (Lk). ARIZONA: Santa Cruz Co.: Beasley & Finzel 851 (N).

VERBENA CLAVATA Ruiz & Pav.

Additional synonymy: Verbena clvaara Ruiz & Pav. apud Pers., Sp. Pl. 3: 346, sphalm. 1819.

Additional bibliography: Pers., Sp. Pl. 3: 346. 1819; Steud., Nom. Bot. Phan., ed. 1, 873. 1821; J. F. Macbr., Field Mus. Publ. Bot. 13 (5): 613, 615, 617-618, 621, & 625. 1960; Moldenke, Phytologia 16: 49. 1968; Moldenke, Résumé Suppl. 16: 28. 1968; Mol-

denke, Fifth Summ. 1: 143 & 192 (1971) and 2: 621, 658, 663, 668, 701, & 913. 1971.

Macbride (1960) keeps V. calcicola Walp. separate from V. clavata Ruiz & Pav., with V. gynobasis Wedd. as a synonym of the former. In his discussion of V. calcicola he says "Included by Schauer in V. clavata R. & P. and conceivably it may be an ecological condition". He cites for it Field Mus. neg. 17409, as well as Gay s.n. from Cuzco, Meyen s.n. and Weberbauer 1455 from Arequipa, and Weberbauer 7464 and Weddell s.n. from Moquegua. For V. clavata he cites Ferreyra 8031, Goodspeed 9184, and Sandeman 4611 from Ancash, Eyerdam 25159, Goodspeed Exped. 15719, Isern 2477, and Mexia 04170 from Arequipa, Isern 2478 from Moquegua, and Metcalf 30374 from Tacna, and says that it occurs also in Chile. I regard the Ferreyra and Mexia collections as var. casmensis Moldenke.

Macbride also attempts to keep V. fissa Hayek as a separate entity, citing for it the following collections: PERU: Ancash: Raimondi s.n. [Hualas]; Weberbauer 2768 (type). Arequipa: Ferreyra 5554; Guenther & Buchtien 133 & 133a; I. M. Johnston 3560; Weberbauer 389. Tacna: Metcalf 30374 [also cited by him as V. clavata]; Weberbauer 7385. He comments: "Near V. thymoides Cham. but more depressed, more densely pubescent, larger flowers; as V. calcicola Walp., cited as a synonym in Index Kewensis, may also prove to be a variant of V. clavata R. & P. as suggested by Johnston. About 3 dm. tall, flowers white or pink, on middle and lower green slopes (Johnston)...F. M. Neg. 17416." He attempts to separate the three supposed species as follows in his key:

Leaves closely canescent strigillose-hispidulous.....V. calcicola
 Leaves more or less canescent hirsute-villous-strigose.....V. clavata
 Leaves lightly hispidulous, greenish.....V. fissa

Additional citations: PERU: Arequipa: Vargas Calderón 18089 (Ac).

VERBENA CLAVATA f. ALBIFLORA Moldenke

Additional bibliography: J. F. Macbr., Field Mus. Publ. Bot. 13 (5): 618. 1960; Moldenke, Phytologia 11: 453. 1965; Moldenke, Fifth Summ. 1: 143 (1971) and 2: 913. 1971.

VERBENA CLAVATA var. CASMENSIS Moldenke

Additional bibliography: J. F. Macbr., Field Mus. Publ. Bot. 13 (5): 618. 1960; Moldenke, Phytologia 11: 453. 1965; Moldenke, Fifth Summ. 1: 143 (1971) and 2: 913. 1971.

Macbride (1960) says of this variety: "Var. casmensis....has scarcely revolute leaves mostly drying blackish, about 3 mm. wide, with short unevenly spreading twisted trichomes both sides; flowers lilac, fragrant. Leaves resemble those of V. trifida; spreading pubescence differs from both plants."

xVERBENA CLEMENSORUM Moldenke

Synonymy: Verbena clemensorum Moldenke apud Howell, Wasmann Journ. Biol. 10: 377. 1952. Verbena officinalis L. x V. robusta Greene ex Moldenke, Résumé 371, in syn. 1959. Verbena robusta Greene x V. officinalis L. ex Moldenke, Résumé 373, in syn. 1959.

Additional bibliography: Moldenke, Phytologia 11: 453-454. 1965; Munz, Suppl. Calif. Fl. 101. 1968; Moldenke, Fifth Summ. 1: 65 (1971) and 2: 686, 693, & 913. 1971.

Munz (1968) says "V. Clemensorum Moldenke described as possible hybrid between V. officinalis and V. robusta, from Jackson, Amador Co. Coarse herb with glabrous stems, stiff ovate incised lvs. 2.5-8 cm. long; infl. spicate, compound, ± puberulent, elongate; corolla 2 mm. wide."

VERBENA CLOVERAE Moldenke

Additional bibliography: Hocking, Excerpt. Bot. A.6: 91. 1963; Moldenke, Phytologia 16: 186. 1968; Moldenke, Résumé Suppl. 16: 2. 1968; Rickett, Wild Fls. U. S. 3 (2): 365. 1969; Moldenke in Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. Bot. 6:] 1315, 1316, & 1321. 1970; Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. Bot. 6:] 1876 & 1877. 1970; Moldenke, Fifth Summ. 1: 58 & 75 (1971) and 2: 663, 685, 774, & 913. 1971.

Recent collectors have found this plant growing in sandy soil, sandy silt, red sand, or light brown sandy loam, on clay and gravel hills, and along roadsides. Wood reports that it "covers large areas [in Starr County, Texas], common, very similar to no. 692 but flowers twice as large and very showy". Drawe found it "abundant on sandy loam soil in heavily grazed pastures" in Hidalgo County and Atwood in Opuntia-mesquite communities in Dimmit County, while Runyon describes it as having "leaves pinnately cleft, rugose, petiole winged, flowers with no odor, blooming from April to May.....a low herb apparently with perennial roots". Pladeck states that it has "perennial rootstocks". The corolla color is given as "blue" on Drawe 296, R. Runyon 2611, and Stokes 19, as "brilliant blue" on Pladeck s.n. [May 5, 1940], and as "lavender to blue" on A. D. Wood 693. R. Runyon 4869 is a mixture with V. plicata Greene.

Material of V. cloverae has been misidentified and distributed in some herbaria as V. neomexicana var. hirtella Perry and V. scabra Vahl. On the other hand, the Novoa & Cantu 18a, distributed as V. cloverae, is actually V. ciliata var. longidentata Perry.

Additional citations: Brooks Co.: Pladeck s.n. [May 5, 1940] (Ws). Dimmit Co.: Atwood 2035 (N). Edwards Co.: H. R. Reed 47 (Mi). Hidalgo Co.: Drawe 296 (Lk); R. Runyon 2611 (Au--268731), 4869, in part (Au--269729). Jim Hogg Co.: R. Bruno 41 (Lk); Sosa 332 (Lk). Kleberg Co.: F. B. Jones 2977 (Lk). La Salle Co.: Alvarez, Guajardo, Salazar, & McCart 7614 (Lk); F. A. Barkley 17T078 (Ip); A. Castro 55 (Lk). Starr Co.: Ramos & Murillo 52 (Au); R.

Runyon 4885 (Au--266150); A. D. Wood 693 (Au--247078, Au). Webb Co.: Abrigo s.n. [April 12, 1963] (Au--219722); McCart 7289 (Mi); R. L. McGregor 16764 (N); J. Stokes 19 (Lk). Zapata Co.: Flores & Powell 112 (Lk); M. Gonzalez 5 (Au--245139, Ip). Zavala Co.: Guerra, Garcia, & Garcia 40 (Au--244879).

VERBENA CLOVERAE f. ALBA Lundell

Synonymy: Verbena cloverae alba Lundell apud Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. Bot. 6:] 1876. 1970.

Additional bibliography: Moldenke, Phytologia 16: 49. 1968; Moldenke, Résumé Suppl. 16: 2. 1968; Moldenke in Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. Bot. 6:] 1315, 1316, & 1321. 1970; Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. Bot. 6:] 1876. 1970; Moldenke, Fifth Summ. 1: 58 (1971) and 2: 663 & 913. 1971.

This form has been found in flower and fruit in May.

Additional citations: TEXAS: Dimmit Co.: Tharp & York 27 (Ip).

VERBENA COCCINEA Raf.

Additional bibliography: Moldenke, Phytologia 10: 102--103. 1964; Moldenke, Fifth Summ. 1: 66 (1971) and 2: 793 & 913. 1971.

VERBENA COCHABAMBENSIS Moldenke

Additional bibliography: Moldenke, Phytologia 16: 49. 1968; Moldenke, Fifth Summ. 1: 184 (1971) and 2: 684 & 913. 1971.

VERBENA COMONDUENSIS Moldenke

Bibliography: Moldenke, Phytologia 13: 343--344. 1969; Moldenke, Biol. Abstr. 50: 12948. 1969; Hocking, Excerpt. Bot. A.18: 444. 1971; Moldenke, Fifth Summ. 1: 75 (1971) and 2: 913. 1971.

My wife, my son, and I visited the type locality of this species last year and find that it makes a very conspicuous show as it grows in masses in wet sandy depressions in roadside flats for several miles in the type area.

Citations: MEXICO: Baja California: Moldenke & Moldenke 2922 (Z-type), 25407 (Ac, Ft, Rf, Z).

xVERBENA CONATA Moldenke

Synonymy: Verbena halei Small x V. officinalis L. ex Moldenke, Résumé 365, in syn. 1959. Verbena officinalis L. x V. halei Small ex Moldenke, Résumé 371, in syn. 1959.

Additional bibliography: Hocking, Excerpt. Bot. A.1: 430. 1959; Moldenke, Phytologia 11: 454. 1965; Moldenke, Fifth Summ. 1: 370 (1971) and 2: 649, 672, 686, & 913. 1971.

VERBENA CONCEPCIONIS Moldenke

Additional bibliography: Moldenke, Phytologia 9: 201. 1963; Moldenke, Fifth Summ. 1: 192 (1971) and 2: 913. 1971.

xVERBENA CORRUPTA Moldenke

Additional synonymy: Verbena peruviana (L.) Britton x V. phlogi-

flora Cham. ex Moldenke, Résumé 372, in syn. 1959. Verbena phlogiflora Cham. x V. peruviana (L.) Britton ex Moldenke, Résumé 372, in syn. 1959.

Additional bibliography: Moldenke, Phytologia 16: 89 & 93. 1968; Moldenke, Résumé Suppl. 16: 28. 1968; Moldenke, Fifth Summ. 1: 370 (1971) and 2: 522, 689, & 913. 1971.

It appears that the cultivars known as "Defiance" (Hurst; Vaughan's; Waller-Franklin; Withamfogg), "Defiance Re-selected" (Watkins & Simpson), "Défiance" (Haage & Schmidt), and "Défiance Purpurea" (Haage & Schmidt) all belong to xV. corrupta rather than to xV. hybrida Voss as previously reported by me. "Defiance" is described as spreading, 12--16 inches tall, blooming in early July (in the U. S. A.), the flowers 1/2 inch wide, rich-scarlet or red with a small creamy-white "eye". Haage & Schmidt describe "Défiance" as "feuer scharlach" [fiery-scarlet] and "Défiance Purpurea" as "purpurroth" [purple-red] in color of corolla.

VERBENA CORYMBOSA Ruiz & Pav.

Additional & emended bibliography: Pers., Sp. Pl. 3: 347. 1819; Steud., Nom. Bot. Phan., ed. 1, 873. 1821; Reiche & Phil., Fl. Chil. 5: 283 & 285. 1910; Angely, Fl. Anal. Paran., ed. 1, 571. 1965; Yotaro, Gard. Pl. World 1: 131. 1965; Moldenke, Phytologia 16: 49--50. 1968; Coats, Pl. Hunters 376. 1969; Heusser, Pollen & Spores Chile 62 & 78. 1971; Moldenke, Fifth Summ. 1: 143, 177, 189, 192, & 370 (1971) and 2: 652, 688, 736, & 914. 1971.

The corollas of this plant are described as "blue-violet" on Burkart 19986. Heusser (1971) says that the pollen has "a tendency to occur chiefly as a pericolpate or pericolporate type with apertures associated with the contact edges of the faces; 41--79 μ ", based on a collection by J. Gallardo (SGO 66315), no locality of collection designated. He gives the distribution of the species in Chile as "Atacama--Valdivia" and compares its pollen grains with those of Junellia uniflora (R. A. Phil.) Moldenke, which are syncolporate. He does not specify if he does or does not regard this as sufficiently important to be a generic character.

Coats (1969) reminds us that Elliott & Comber, during their second Chilean trip in 1929--1930, collected for eventual introduction into the horticultural trade the "hardy Verbena corymbosa".

Additional citations: BRAZIL: Santa Catarina: Smith & Klein 13460 (N). URUGUAY: Burkart 19986 (N, W--2595165).

xVERBENA COVASII Moldenke

Additional synonymy: Verbena santiaguensis (Covas & Schnack) Moldenke x V. tenuisecta Briq. ex Moldenke, Résumé 373, in syn. 1959. Verbena tenuisecta Briq. x V. santiaguensis (Covas & Schnack) Moldenke, Résumé 376, in syn. 1959.

Additional & emended bibliography: J. A. Clark, Card Ind. Gen. Sp. Var. issue 191. 1945; Schnack & Covas, Revist. Argent. Agron. 12: 224 & 228. 1945; Moldenke, Phytologia 11: 454. 1965; Moldenke,

Fifth Summ. 1: 370 (1971) and 2: 522, 694, 700, & 914. 1971.

VERBENA CRITHMIFOLIA Gill. & Hook.

Additional synonymy: Verbena crithmifolia Gill. & Hook. apud Beetle, Bot. Rev. 9: 670, sphalm. 1943. Glondularia erithnifolia Gill. & Hook. ex Moldenke, Fifth Summ. 2: 523, in syn. 1971.

Additional bibliography: Autran, Trab. Mus. Farmac. Fac. Cienc. Méd. Buenos Aires 13: 33. 1907; Frenguelli & Cabrera, Rev. Mus. La Plata, n. ser., sec. ofic., 1938: 77. 1939; J. A. Clark, Card Ind. Gen. Sp. Var. issue 183. 1944; Troncoso in Böcher, Hjerting, & Rahn, Dansk Bot. Arkiv. 22 (1): 109. 1963; Troncoso in Cabrera, Fl. Prov. Buenos Aires 5: 137. 1965; Moldenke, Phytologia 16: 186. 1968; Moldenke, Résumé Suppl. 16: 28. 1968; Moldenke, Fifth Summ. 1: 137, 192, & 200 (1971) and 2: 521, 523, 534, 664, 665, 668, & 914. 1971.

Collectors have found this plant growing in dry alkaline soil and in riverbeds, fruiting in April, September, and November (in addition to the months previously reported). Semper 117 bears a label stating that the plant was "rare" where collected (in Mendoza, Argentina), although this same collector reports it as "abundant" in other parts of the same province on other labels. The corollas are said to have been "lilac" on Semper 117, "pinkish-white" on Semper 585 & 616, and "lilac-white" on Semper 65.

Troncoso (1965) comments that "Todas las citas de V. crithmifolia.....dadas para la Provincia [Buenos Aires] deben referirse a esta especie [V. hookeriana]."

The Eyerdam, Beetle, & Grondona 23443, distributed as V. crithmifolia, is actually V. hookeriana (Covas & Schnack) Moldenke.

Additional citations: ARGENTINA: Mendoza: Lourteig 894 [Herb. Inst. Miguel Lillo 113935] (N), 925 [Herb. Inst. Miguel Lillo 114040] (N); Semper 7 (N, S), 22 (N), 65 (N), 117 (N), 439 (N), 585 (N), 616 (N). Río Negro: O'Donell 1844 (N).

xVERBENA CROOKSHANKSI Moldenke

Synonymy: Verbena bracteosa x hastata Rydb., Fl. Rocky Mtns., ed. 2, pr. 1, 740. 1922. Verbena bracteata Lag. & Rodr. x V. hastata L. ex Moldenke, Fifth Summ. 2: 656, in syn. 1971. Verbena hastata L. x V. bracteata Lag. & Rodr. ex Moldenke, Fifth Summ. 2: 673, in syn. 1971.

Bibliography: Rydb., Fl. Rocky Mtns., ed. 1, 740 (1917), ed. 2, pr. 1, 740 (1922), ed. 2, pr. 2, 740 (1954), and ed. 2, pr. 3, 740. 1969; Moldenke, Fifth Summ. 2: 656, 673, 914, & 967. 1971.

Rydberg (1917) describes this hybrid as "Resembling most V. bracteosa in habit, but stouter, more erect, with broad, laciniate rather stout dissected leaves and shorter bracts. Neb.—Colo."

VERBENA CUNEIFOLIA Ruiz & Pav.

Additional bibliography: Pers., Sp. Pl. 3: 346. 1819; Steud., Nom. Bot. Phan., ed. 1, 873. 1821; Reiche & Phil., Fl. Chil. 5:

287. 1910; J. F. Macbr., Field Mus. Publ. Bot. 13 (5): 614 & 619. 1960; Moldenke, Phytologia 16: 50. 1968; Moldenke, Fifth Summ. 1: 143 & 192 (1971) and 2: 665, 701, & 914. 1971.

Vargas Calderón found this species in flower and fruit in October. Macbride (1960) cites Field Mus. neg. 17411 and the following specimens: PERU: Ancash: Raimondi s.n. [Pomabamba, Huaraz], Weberbauer 3060. Cuzco: Herrera 1409. Huancavelica: Raimondi s.n. [Tayacaya]. Huánuco: Macbride & Featherstone 1210. Junín: Soukup 3537 & 3970, Stork 10920. San Martín: Ruiz & Pavon s.n. [Moyobamba], type.

Additional citations: PERU: Ancash: Vargas Calderón 10320 (Ac).

VERBENA CURTISII Moldenke

Additional bibliography: Moldenke, Phytologia 10: 103. 1964; Moldenke, Fifth Summ. 1: 23 & 370 (1971) and 2: 793 & 914. 1971.

xVERBENA DEAMII Moldenke

Additional synonymy: Verbena bracteata Lag. & Rodr. x V. stricta Vent. ex Moldenke, Résumé 359, in syn. 1959. Verbena stricta Vent. x V. bracteata Lag. & Rodr. ex Moldenke, Résumé 375, in syn. 1959.

Additional bibliography: Rydb., Fl. Rocky Mtns., ed. 2, pr. 1, 740 (1922) and ed. 2, pr. 2, 740. 1954; Hitchc., Cronq., & Ownbey, Vasc. Pl. Pacif. Northwest 4: 244. 1959; Moldenke, Phytologia 16: 50. 1968; Moldenke, Résumé Suppl. 16: 1, 2, & 28. 1968; Rydb., Fl. Rocky Mtns., ed. 2, pr. 3, 740. 1969; Moldenke, Fifth Summ. 1: 15, 34, 37, 40, 41, 43, 45, 51, & 53 (1971) and 2: 656, 657, 666, 697, 698, & 914. 1971.

Fell & Fuller found this hybrid growing along roadsides in Winnebago County, Illinois. Patterson notes that in Henderson County of the same state he found some plants procumbent, some ascending, and some erect -- which is to be expected of the hybrid, considering its parentage.

Additional citations: ILLINOIS: Henderson Co.: H. N. Patterson s.n. [Oquawka, July] (Pa, Pa, Pa). Winnebago Co.: Fell & Fuller 56-301 (Ws).

VERBENA DELICATULA Mart.

Additional bibliography: Moldenke, Phytologia 10: 104. 1964; Moldenke, Fifth Summ. 1: 75 (1971) and 2: 665 & 914. 1971.

VERBENA DELTICOLA Small

Additional bibliography: Hocking, Excerpt. Bot. A.6: 91. 1963; Moldenke, Phytologia 16: 186. 1968; Moldenke, Résumé Suppl. 16: 2. 1968; Rickett, Wild Fls. U. S. 3 (2): 364. 1969; Moldenke in Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. Bot. 6:] 1316, 1317, & 1322-1323. 1970; Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. Bot. 6:] 1799, 1846, & 1876. 1970; Moldenke, Phytologia 22: 497. 1971; Moldenke, Fifth Summ. 1: 58 & 75 (1971) and 2: 665 & 914. 1971.

[to be continued]

BOOK REVIEWS

Alma L. Moldenke

"FUNDAMENTALS OF ECOLOGY" 3rd Edition by Eugene P. Odum, xiv & 574 pp., illus., W. B. Saunders Company, London W. C. 1, Toronto 7 & Philadelphia, Pennsylvania 19105. 1971. £5.00 U.K., \$12.10 Canada, \$11.75 U.S.

Each of the editions of this text in its time surpassed and now surpasses in quality of its presentation, content, clarity of language, instructional value and accuracy of its many diagrams and photographs, and principles developed -- all others on the market by wide, wide margins.

I remember coming upon the first edition new in 1953 long after my college days when there were no ecology courses and being literally thrilled reading this text from cover to cover.

This particular edition has been extensively revised and has been emended with much new illustrative material and up-to-date bibliography. It has been so organized by stated chapters that it can be used by three different groups of students: (1) non-biology majors in "man and environment" or "human ecology" courses, (2) those in the standard or advanced undergraduate courses in ecology with field and laboratory work, and (3) postgraduates whose courses deal with principles, environments and ecological technology.

When such an outstanding text by such an outstanding ecologist and teacher is kept up-to-date and available, why do some college professors still order all those mediocre works for their classes?

"FOREST TREES OF THE PACIFIC SLOPE" by George B. Sudworth, xv & 455 pp., illus., facsimile edition of the 1908 Forest Service of the U. S. D. A. edition. Dover Publications, Inc., New York, N. Y. 10014. 1967. \$5.00 paperback.

In Volume 22, Number 5, of this journal this book was most appreciatively reviewed, but with the present publishing house somehow inadvertently omitted.

"A FIFTH SUMMARY OF THE VERBENACEAE, AVICENNIACEAE, STILBACEAE, DICRASTYLIDACEAE, SYMPHOREMACEAE, NYCTANTHACEAE, AND ERIOCAULACEAE OF THE WORLD AS TO VALID TAXA, GEOGRAPHIC DISTRIBUTION, AND SYNONYMY" by Harold N. Moldenke, 2 vols., 942 pp., Braun-Brumfield, Printers. Orders to 303 Parkside Road, Plainfield, New Jersey 07060. 1971. \$25.00 plus 80 cents postage.

This is more a report than a review of a detailed work that summarized over four decades of taxonomic, field and herbarium studies in these groups. Over five thousand specific and infraspecific taxa and hybrids are recognized in over a hundred accepted genera. A di-

chotomous key distinguishes the genera and 248 subgroups. Over 15,000 synonyms and rejected names are listed alphabetically. Actually 20,753 scientific names are accounted for.

Since these families have worldwide distribution, the geographic distribution ultimately mentions all countries in the world, with the larger ones subdivided into their states, departments, etc.

Among the cultivated members almost 700 species, varieties and hybrids are considered.

Fossil forms are represented by 37 species with their geologic horizons and locations noted.

Because of format and indexing it is easy to locate any species or geographic area.

Surely this reference work should be indispensable to any institution undertaking botanical research.

"MAN AND THE ECOSPHERE — Readings from 'Scientific American'" with commentaries by Paul R. Ehrlich, John P. Holdren & Richard W. Holm, 307 pp., illus. W. A. Freeman & Co., San Francisco, California 94104. 1971. \$11.00 clothbound, \$5.75 paperbound.

These papers have been chosen by an outstanding trio of scientists long and acutely aware of our global ecological situations and prospects from a 15-year span of this excellent journal. The 27 papers are organized under the following topics: the ecosphere and preindustrial man; limits rarely perceived as to human population, water supply, depleted lateritic soils, food; dimensions of intervention as in DDT use, thermal pollution; on management and buying time as desert reclamation; use of fusion power; urbanization.

There are many effective diagrams and photographs. Cross references, biographical notes, bibliographies and a general index are given. The only defects noted were the misspelling of Pleistocene on p. 7 and defective color keys to diagrams on pp. 89 and 221.

This valuable material should (must) reach many eyes (and minds) in all our higher schools and throughout our literate public. It makes excellent supplementary or "required" reading for general biology and ecology courses along with the companion volume on "The Biosphere".

"EXOTIC PLANT MANUAL — Fascinating Plants to Live with — Their Requirements, Propagation and Use" by Alfred Byrd Graf, 840 pp., illus., Roehrs Company, East Rutherford, New Jersey 07073. 1970. \$27.50.

For those who know and use that marvellous work known as "Exotica" all that is necessary for an evaluation of the present book under review is to label it a "Baby Exotica" and announce that it contains over 4,200 photographs, with 170 in true color, and has similar but condensed text on the origin, history, geography, arrangement, planting care and pest control of exotic plants. The "Baby" was surely not born like normal mortals but, like Athena,

sprung full-formed from the head of Zeus. It contains so much closely compacted information, yet the author's personal enthusiasm shines through.

For those who do not know "Exotica" — they should. And this book is a reasonably priced introduction to it.

The competent plant-loving author has spent a lifetime in publication and horticulture with trips all over the world.

The taxonomic material is treated with considerable accuracy. For members of the Verbenaceae the following changes are suggested:

Verbena tenera var. maonetti for V. peruviana on p. 410.

Verbena hybrida (1873) for V. x hortensis (1909) as the older name on p. 411.

Clerodendrum umbellatum var. speciosum for C. speciosum on p. 492 — scarcely, if at all, different from the wild C. umbellatum.

Clerodendrum philippinum for C. fragrans pleniflorum — an unfortunate recently discovered name-change apparently forced on us by the International Rules — on p. 492.

"AN ISLAND CALLED CALIFORNIA — An Ecological Introduction to its Natural Communities" by Elna S. Bakker, xiv & 357 pp., illus., University of California Press, London, Los Angeles, New York and Berkeley, California 94720. 1971. \$10.00.

The title comes not only historically from Montalvo's grotesque description in the 1500's "on the right hand of the Indies there is an island called California, very near the Terrestrial Paradise" but also ecologically, topographically (San Andreas fault) and climatically from its differences with the rest of the continent in species and natural communities. "Isolated by sea, mountain range, and desert, this area has developed in its own way and at its own pace; evolutionary history here has woven numerous distinctive patterns of interaction between life form and the land. Like the fire pines and cypresses, many such patterns are tag ends, remnants of much larger biological designs. Others, like chaparral and coniferous forest, run repeatedly through the warp and woof of natural California. Such are the patterns of survival through a rainless summer, on a serpentine slope, in a Sierra canyon.....that are incredibly intricate, multiple, and unfortunately irreplaceable, if obliterated by man's heedlessness or apathy."

The text describes accurately and attractively the natural communities encountered on this book-tour from the San Francisco Bay area eastward across the High Sierras to the state's border and then south through the deserts. There are attractive black and white photographs and some excellent ecological diagrams. At the end there are a finely chosen topical bibliography, useful but not complete (for example, wocas on p. 201) lists of the scientific names of the plants and animals mentioned, and an index. The book looks very neat, yet a few words were misspelled: absence on p. 71, descendants on p. 97, and chapter on p. 209.

The University of California Press deserves much appreciation

for its many popular and/or scientific contributions of high caliber rolling off its presses year after year.

"WORLD VEGETATION TYPES" edited by S. R. Eyre, 264 pp., illus., Columbia University Press, New York, N. Y. 10025. 1971. \$12.50.

This book, small in size but far from small in its scientific value or purchase price, contains a representative selection of writings which deal with examples of those main types of wild vegetation which covered most of the land areas of the earth until relatively recent times. They range in original publication time from 1918 to 1969, from a wide variety of journals and books, and from 24 recognized writers from several countries and times. They all make valuable reading and all are provided with their own bibliographies.

At the close of the book there is no index but there is a selected bibliography topically arranged as follows: tropical rain forest, tropical seasonal forest and tropical savanna, tropical montane vegetation, mid-latitude forests, sclerophyllous shrublands, mid-latitude grasslands and grassland-forest ecotones, mid-latitude desert and semi-desert, tundra and tundra-forest ecotones, and regional accounts. The thinking is strongly influenced by the Clementsian "life-form" and "climatic climax" concepts.

There are some fine black/white photographs of several of these world vegetation types.

"MICROORGANISMS AND MAN" by Orville Wyss & Curtis Eklund, ix & 389 pp., illus., John Wiley & Sons, Inc., London, Sydney, Toronto & New York, N. Y. 10016. 1971.

"This textbook is a [well structured and really interesting] guide for an elementary course in microbiology....The students who complete this course will acquire a sympathetic view of science and scientists and will learn that procedures for securing scientific information are within their own capabilities." The text is effectively illustrated with many black/white photographs and diagrams. The glossary and index are both useful.

The book stresses the various types of organisms covered in microbiology, antigens and antibodies, infectious diseases of man, water and food and industrial microorganisms.

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SCLEROCARPUS UNISERIALIS (COMPOSITAE) IN TEXAS AND MEXICO

Charles Feddema

Forest Service Herbarium, Fort Collins, Colorado 80521.

The genus Sclerocarpus (Compositae-Heliantheae) consists of yellow-rayed sunflowers common locally in southeastern Texas and in much of Mexico and Central America. Of the eight species known, one occurs widely in tropical Africa whereas the others are American. Although one species is perennial the rest are somewhat weedy annuals most commonly encountered along roadsides and field margins or in grain-fields and pastures. Superficially, Sclerocarpus resembles several other genera of the Heliantheae. It is unique, however, in that the receptacular bracts completely surround the disk achenes, and at maturity those near the margin of the disk become thick and hard, closely surround the achene, and develop tubercles or swellings on the surface. This peculiar fruit type, consisting of the achene and its closely investing bract, is here designated a sclerocarp.

The genus was proposed by J. N. Jacquin (1781) who published a series of plates including one entitled Sclerocarpus africanus. It represented the African species later validly published under that name. A second species was discovered by Thomas Drummond at San Felipe, Austin County, Texas, and described by Hooker (1837) as Gymnopsis uniserialis. This was later transferred to the proper genus by Hemsley (1881). Correll and Johnston (1970) recognize S. uniserialis as the only species in Texas, and indicate that it is widespread in Mexico. A number of populations closely related to S. uniserialis do occur in Mexico, and recent studies on their morphological variation and geographic range have been the basis of the taxonomic revision of the group presented here.

One population from Mexico was described as S. uniserialis var. papposus Greenman. This differs in so many characters and to such a degree from the Texas plants, however, that it must be regarded as a distinct species. The remaining populations are more closely related, morphologically, to the Texas plants and must be considered as sub-specific elements of S. uniserialis. Thus circumscribed, S. uniserialis is the most variable species in the genus and the most wide-ranging one in America. It consists of three major populations and a number of minor ones, all apparently having the same chromosome number and varying degrees of isolation from each other. These major populations are here treated as varieties and may be distinguished from each other and from S. papposus by the following key.

KEY TO THE TAXA

- A. Involucral bracts inconspicuous, acicular-involute, mostly less than 3 mm. long; receptacle white-pubescent, scarcely enlarged from the peduncle; pappus of marginal disk achenes 1.5-4 mm. long; anthers conspicuously exerted at anthesis.....1. S. papposus
- A. Involucral bracts evident, mostly 4-30 mm. long; receptacle glabrous, conspicuously enlarged from the peduncle; pappus of marginal disk achenes less than 1.5 mm. long; anthers mostly retained in the corolla at anthesis.....2. S. uniserialis
- B. Receptacular bracts green in bud or red only on apical margin; mature marginal sclerocarps ribbed or with low, uniform tubercles; involucral bracts mostly more than 5 mm. long; plants mostly more than 5 dm. tall.
- C. Mature marginal achenes elliptic-fusiform; mature marginal sclerocarps cylindrical-conoid, the body mostly low-tubercled, gradually reduced to the beak, not or scarcely bent.....2a. var. uniserialis
- C. Mature marginal achenes obliquely obovate in lateral outline; mature marginal sclerocarps somewhat laterally compressed, the body smooth or ribbed, the beak strongly bent from it.....2b. var. frutescens
- B. Receptacular bracts red or purplish in bud; mature marginal sclerocarps swollen about the middle with large complex tubercles; involucral bracts mostly less than 5 mm. long; plants mostly less than 5 dm. tall.....2c. var. rubridiscus

TAXONOMY

1. SCLEROCARPUS PAPPOSUS (Greenm.) Feddemma, comb. nov.

Sclerocarpus uniserialis var. papposus Greenman, Field Mus. Publ. Bot. 2:346. 1912. Type: MEXICO: GUERRERO: Rio Balsas, 26 Aug 1910. C. R. Orcutt 4208 (Holotype F! Isotype MO!).

Erect, mostly strigose annuals to 1 m. tall, the branches long and slender, opposite below, alternate above; leaves 5-12 (20) cm. long, blades ovate-trullate to deltoid, scabrous to strigose above, strigose beneath, petiole mostly one-fourth to one-third as long as the blade; heads few to several, obconoid, 10-20 mm. high, on long, often curved, peduncles; receptacle green, strigose, conical, 1.5-3.5 mm. high, little wider than the peduncle; involucre inconspicuous, bracts 3-7, green, mostly less than 3 mm. long, involute-acicular in age; ray flowers 3-7, neutral, ligule yellow-orange, mostly broadly ovate, 6-12 mm. long, tube greenish, subequal to the ligule; ray achenes green, fleshy throughout when living, persistent on the receptacle; disk flowers (4) 6-12 (15), arcuate, ascending, corolla 8-14 mm. long, greenish or yellow below, reddish near the lobes, these reddish at the base with the apex recurved, bristly without, papillate within; anthers exerted at anthesis; immature receptacular bracts thin, green, arcuate, tubular, enclosing the corolla nearly to the lobe; mature sclerocarps to 13 mm. long, cylindric-conoid narrowing gradually to the apex of the achene, more sharply so to the beak or enlarged again about the pappus, the surface with rows of low tubercles; disk achenes fusiform-arcuate, 7-11 mm. long including the pappus, this a conspicuous green or yellow crown of irregular fused bristles to 4 mm. long.

Guerrero, at elevations of approximately 500 to 2,000 meters, flowering August to October.

This species is most closely related to S. uniserialis from which it differs chiefly in its very long pappus, its longer sclerocarps, its very small pubescent receptacle, short involucre bracts, and reduced number of disk flowers. It is a rare species known only from the type collection and two others.

Additional specimens examined: GUERRERO: North of Rio Balsas, Dist. Adama, Temisco, top of Barranca Limo, 30 Oct 1939, Ynez Mexia 8707 (F, GH, MO, NY, US); Taxco Viejo, 18 Sept 1937, R. Q. Abott 402 (GH).

2. *SCLEROCARPUS UNISERIALIS* (Hook.) Benth. & Hook. f. ex
Hemsley, Biol. Centr. Am. Bot. 2:164. 1881.

Erect, mostly strigose annual, to 2 m. tall, branches long, ascending, opposite below, alternate above, pubescence sometimes somewhat spreading; leaves 3-6 (20) cm. long, the cauline large, long-petioled, soon withering, those of the branches smaller, petiole mostly one-fourth to one-third as long as the blade; blade ovate-trullate to deltoid, scabrous or with ascending hairs above, strigose beneath, margin dentate, apex mostly acute or acuminate, base mostly cuneate; heads few to numerous, hemispheric to cylindric, 7-25 mm. high, solitary, terminating the long-pedunculate branch-ends; receptacle whitish, glabrous, conical, to 10 mm. long; involucre uniseriate, campanulate in bud, spreading or reflexed in age, bracts 5-9 (12) green, mostly 5-10 (15) mm. long, linear-elliptic or oblanceolate, often oblique; ray flowers 5-9, neutral, ligules yellow-orange, ovate-oblong to suborbicular, 6-20 (30) mm. long, the apex shallow-toothed, tube one-fifth to one-half as long as the ligule; ray achenes greenish, fleshy throughout, linear-arcuate when living, shriveled and persistent on the receptacle when dry; disk flowers (5) 15-40 (50), spreading to erect, corolla 6-13 mm. long, gradually enlarged from base to throat, yellow or reddish or with zones of both colors, lobes 2-5 mm. long, recurved, strigose or bristly at the apex without, long papillate near the middle within; anthers mostly retained in the corolla tube; receptacular bracts green or purplish in bud, enclosing the corolla to about the middle, the mature bract (sclerocarp) 3-10.5 mm. long, beaked, green, brownish, purple, or mottled, the surface sparsely strigose, low-ribbed or tubercled, the body often somewhat laterally compressed; marginal disk achenes 3-6 mm. long including the pappus, black, often somewhat laterally compressed, fusiform-arcuate or obliquely obovate in lateral outline; pappus a crown of basally fused bristles sometimes reduced to form one or more scales, mostly less than 1 mm. long.

The total range of *S. uniserialis* includes an elongated area from southeastern Texas to northwestern Guatemala. The three varieties form a graded series, morphologically, from north to south in respect to the height of the plants, the length of the involucre bracts, the form of the mature receptacular bract (sclerocarp) and other characters. Plants from Texas are 1-2 m. tall with involucre bracts 1-3 cm. long and straight sclerocarps with small tubercles

or none. Plants from Guerrero are typically less than 1/2 m. tall, have involucre bracts less than 1/2 cm. long, sclerocarps which are strongly bent and have large tuberculate swellings about the middle. Plants from eastern Mexico are intermediate in these characters.

2a. SCLEROCARPUS UNISERIALIS (Hook.) Benth. & Hook. f. ex
Hemsl. var. UNISERIALIS

Gymnopsis uniserialis Hook., Icones Plantarum, Vol.
2.t.145. 1837. Type: TEXAS: Austin Co., San Felipe,
Drummond 135 "bis ...Texas II" (Holotype K!;
isotypes GH! K! NY!).

Aladama uniserialis (Hook.) A. Gray, Journ. Boston Soc.
Nat. Hist. 6:228. 1850.

Sclerocarpus major Small, Fl. Southeastern U.S. 1250.
1903. Type: TEXAS: Bexar Co., Comale Creek, 1847-
1848, Lindheimer 432 (Holotype NY!; isotypes F! GH!
MO! NY! US!).

Mostly 1-2 (2.5) m. tall, usually much-branched; leaves 3-6 (17) cm. long, blade ovate-trullate or rhombic, with 3-8 (16) irregular teeth per side; heads few to many, 10-25 mm. high on peduncles to 15 cm. long; receptacle 3-5 (9) mm. long; involucre often strongly reflexed in age, bracts mostly 5-10 (15) mm. long; ray flowers mostly 5-9, 19-20 (35) mm. long, the ligule mostly narrowly ovate; marginal disk flowers inserted nearly perpendicular to the surface of the receptacle; disk corollas yellow or brownish-red; receptacular bracts green or reddish on the distal margin in bud; mature marginal sclerocarps 6-10.5 mm. long, nearly horizontal on the receptacle, the body 1.5-3 mm. diam, long-conoid, narrowing gradually to the beak; the body with a few long longitudinal ribs, sometimes with small rounded tubercles on the ribs or scattered on the beak; mature marginal achenes 4-6 mm. long, narrowly fusiform, slightly oblique, pappus mostly 0.2-0.5 mm. long, usually lengthened adaxially and abaxially, and reduced laterally.

Chromosome number: N = 12 (Feddemma 1468, MICH).

The Texas populations of S. uniserialis are well isolated from those in Mexico. Although the species ranges nearly to the Rio Grande at Brownsville, the nearest coastal collections known from Mexico are from southern Tamaulipas. Inland, the nearest Mexican plants of the species have been found near Monterrey. In Texas the species ranges from

Fort Bend County, along the coastal plain to Cameron County, up the Rio Grande to Webb County, and its western limits run through Medina and Bexar Counties to Williamson County. Variety uniserialis is very variable genetically and in response to environmental conditions. J. K. Small described S. major which he differentiated from S. uniserialis on the basis of the larger heads and involucre bracts of the former. Plants of this kind occur widely. The first head to develop terminates the main stem and is usually the largest. It may be especially so early in the season if water is plentiful.

Two distinct color forms of var. uniserialis occur. In most plants the disk flowers, like the rays, are yellow. Most plants from Duval, Kenedy, Brooks, Jim Hogg, Starr, and Willacy Counties, however, have reddish or purplish-brown disk flowers.

2b. SCLEROCARPUS UNISERIALIS (Hook.) Benth. & Hook. f. var. FRUTESCENS (Brandg.) Feddema, comb. nov.

Sclerocarpus frutescens Brandg., Univ. Calif. Publ. Bot. 4:281. 1912. Type: SAN LUIS POTOSI: between Bagre and Minas de San Rafael, Jul 1911, C. A. Purpus 5157 (Holotype UC; isotypes F! GH! MO!).

Long-lived annual, mostly 3-10 dm. tall, sometimes persisting with thickened stem and root and rooting at lower stem and branch nodes; leaves mostly 3-8 cm. long; blade mostly narrowly ovate-trullate, sometimes strigose-pilose beneath, the pubescence sometimes yellowish, margin rarely entire, mostly with 4-6 teeth per side; heads few to several, 8-19 mm. high; receptacle (2) 3-5 (9) mm. long; involucre often reflexed at maturity, bracts mostly 4-8 (13) mm. long; ray flowers mostly 5-7, 9-15 (23) mm. long, the ligule narrowly ovate; disk flowers spreading or ascending, yellow or with a purplish area above the middle, the lobes sometimes with a band of purplish hairs within; receptacular bracts green; mature marginal sclerocarps 5-8 (9) mm. long, with broad body and narrow beak about as long and strongly bent; body of the sclerocarp few-ribbed, 1-2 mm. wide at base, widening above, then narrowing sharply to the tubular beak, rarely with numerous small uniform tubercles; mature marginal achenes 3-4.6 mm. long, considerably oblique in lateral outline, sharply narrowed to the pappus.

Chromosome number: $N = 12$ (Feddema 1502, MICH).

Southeastern Coahuila, Nuevo Leon, southern Tamaulipas, San Luis Potosi, Hidalgo, Guanajuato, Mexico, Veracruz, eastern Oaxaca, Campeche, Yucatan, Quintana Roo, Chiapas, and northeastern Guatemala, at elevations from sea level to 2700 meters, usually flowering from March to September but sometimes persisting into the second season.

This variety is distinguishable from var. uniserialis by its shorter, bent sclerocarps and from var. rubridiscus by the longer involucral bract, green receptacular bracts in bud and sclerocarps which are merely ribbed or with small uniform tubercles.

2c. SCLEROCARPUS UNISERIALIS (Hook.) Benth. & Hook. f. ex Hemsl. var. RUBRIDISCUS Feddema, var. nov.

Plerumque brevis, 2-6 (15) dm. alta; folia (2) 3-4 (9) cm. longa; lamina anguste trullata (2) 3-4 (7) cm. longa; bracteae involucri lineares vel oblanceolatae, circiter 2.5-5 mm. longae, 1-2 mm. latae; receptaculum glabrum; marginis receptaculi paleae maturae valde curvae, 6-8 mm. longae, in medio valde turgido-tuberculatae, corpore rostrum plerumque paullo longiore; pappus 0.3-0.9 mm. longus; achenia 4-5 mm. longa.

Plants typically 2-5 dm. tall, the lower branches long, the upper 1-3 short; leaves mostly 2-5 cm. long; blade 1-4 (8) toothed, rarely entire or with short basal lobes or rounded apex; heads 9-20 mm. high; receptacle mostly 5-7 (10) mm. long; involucre appressed to the sclerocarps or slightly spreading in age, bracts mostly 2.5-5 mm. long; ray flowers mostly 5-6, ligule ovate or suborbicular, 8-14 mm. long; disk flowers oriented nearly vertically on the receptacle, the corolla 6-12 mm. long, the lobes reddish below, yellow apically with purplish hairs within near the middle; receptacular bracts reddish-purple in bud; mature marginal sclerocarps 5-9 mm. long, with a broad body subequal to the strongly bent narrow beak; body of the sclerocarp 3-4 mm. long, enlarged above with irregular rounded swellings, narrowed sharply to the tubular beak; marginal achenes 4-5 mm. long, somewhat laterally compressed, obliquely obovate in lateral outline.

Chromosome number: $N = 12$ (Feddema 1710, MICH).

Guerrero, Morelos, western Oaxaca, at elevations of 600 to 2,000 meters, flowering July to November.

Type: GUERRERO: 6 mi S. of Chilpancingo, 13 Aug 1961,
Feddema 1650 (Holotype MICH).

This variety is distinct in its typical form which occurs in a narrow area of Guerrero from near Iguala to Chilpancingo. It is distinguished by its low stature, the purplish receptacular bracts in bud, the short involucral bracts, and the swollen-tuberculate mature sclerocarps.

In addition to the above major populations of Sclerocarpus uniserialis, there are a number of others related to var. rubridiscus but having various combinations of characters making them somewhat intermediate between this and the other varieties. Most plants from near Taxco and from southern Morelos are taller than the typical Guerrero variety (var. rubridiscus) but those in Michoacan appear intermediate between it and var. uniserialis from Texas. In an elongated area from southern Morelos and Puebla through the Valley of Oaxaca to the Isthmus of Tehuantepec, many populations are found which have some characteristics of var. rubridiscus. These plants constitute a relatively uniform population over a large area and are intermediate in form between var. rubridiscus and var. frutescens.

Chromosome counts for the three varieties of S. uniserialis and for intermediates between var. rubridiscus and var. uniserialis and between var. rubridiscus and var. frutescens indicate that $N = 12$ for all populations. No counts have been made for S. papposus but other species were counted at $N = 11, 14,$ and 18 . The existence of intermediates between the principal populations of S. uniserialis, and their similar morphology and the same chromosome numbers suggests that they are closely related and interfertile. The variation and distribution of the various populations of S. uniserialis and S. papposus suggest a classic pattern of speciation in which an ancestral population, relatively homogeneous and interbreeding, by isolation and migration, develops variant populations. Variation has progressed rapidly and to a high degree in S. papposus. S. uniserialis var. uniserialis, apparently not at present interbreeding with other populations, includes considerable variation within itself. Var. frutescens and var. rubridiscus, well differentiated in parts of their ranges, have intermediates between them. These may be relict populations from a period when differentiation was less advanced or may be the result of more recent hybridization and introgression after differentiation and a degree of isolation.

ACKNOWLEDGMENTS

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NOTES ON NEW AND NOTEWORTHY PLANTS. LV

Harold N. Moldenke

BOUCHEA SPATHULATA var. *LONGIFLORA* Moldenke, var. nov.

Haec varietas a forma typica speciei tubo corollae 3--4 cm. longis recedit.

This variety differs from the typical form of the species in having its corolla-tubes 3--4 cm. long.

The type of the variety was collected by Ivan Murray Johnston (no. 8724) on rocky flats and ridges in the vicinity of Aguaje del Pajarito, canyon at the west end of the Sierra de la Fragua, 2--3 km. north of Puerto Colorado, in western Coahuila, Mexico, between September 1 and 3, 1941, and is deposited in the herbarium of the University of Texas at Austin, Texas. The collector describes the plant as a common bush, 2--3 feet tall, in the type locality, with lilac or bluish corollas.

CALLICARPA ACUMINATA var. *ARGUTEDENTATA* Moldenke, var. nov.

Haec varietas a forma typica speciei marginibus laminarum foliorum patente arguteque irregulariterque dentatis recedit.

This variety differs from the typical form of the species in having the leaf-blades irregularly sharp-dentate along the margins with spreading, not appressed, teeth.

The type of the variety was collected by Marshall C. Johnston (no. 5799) along a small creek in thorn forest on limestone slopes 16 miles east of Casas in the northern foothills of the Sierra de Tamaulipas, Tamaulipas, Mexico, on September 28, 1960, and is deposited in the herbarium of the University of Texas at Austin, Texas. The collector notes that the plant was "infrequent" at the type locality.

CALLICARPA ACUMINATA var. *PRINGLEI* (Briq.) Moldenke, comb. nov.

Callicarpa pringlei Briq., Bull. Herb. Boiss., ser. 1, 4: 345-346. 1896.

KALAHARIA UNCINATA f. *RUERA* Moldenke, f. nov.

Haec forma a forma typica speciei corollis rubris recedit.

This form differs from the typical form of the species in having red (rather than yellow) corollas.

The type of the form was collected by Robert J. Rodin (no. 2710) in open bush-veld with *Acacia*, *Zizyphus*, *Grewia*, and other low trees, near Otjiwarongo on the road to Outjo, Namibia, on December 2, 1947, and is deposited in the United States National Herbarium at Washington. The collector describes the plant as an herb 1 to 1 1/2 feet tall with curved thorns and red flowers.

LANTANA VELUTINA f. *MACROPHYLLA* Moldenke, f. nov.

Haec forma a forma typica speciei laminis foliorum usque ad

6.5 cm. longis et 4 cm latis recedit.

This form differs from the typical form of the species in having its leaf-blades to 6.5 cm. long and 4 cm. wide.

The type of the form was collected by Cyrus Longworth Lundell and Amelia A. Lundell (no. 12320) on a mountainside at km. 157 of the Acapulco Highway near Taxco, Guerrero, Mexico, on August 1, 1943, and is deposited in the Lundell Herbarium at the University of Texas at Austin, Texas. The collectors describe the plant as a low shrub, the corollas white with a yellow eye, and the fruits white.

PAEPALANTHUS FULGIDUS var. *ZULOAGENSIS* Moldenke, var. nov.

Haec varietas a forma typica speciei foliis parvioribus recedit.

This variety differs from the typical form of the species in its shorter leaves, which are only to 15 mm. long and about 2 mm. wide.

The type of the variety was collected by Julian Alfred Steyermark (no. 103839) in a swampy savanna, at 2300 m. altitude, on the Planicie de Zuloaga, Río Titirico, Amazonas, Brazil, between October 10 and 15, 1970, and is deposited in the Britton Herbarium at the New York Botanical Garden. The collector notes that the plant grew in dense clumps, the leaves being rich-green on both surfaces, coriaceous-stiff, and the flower-heads whitish.

VERBENA GUARANITICA (Troncoso) Moldenke, comb. nov.

Glandularia guaranitica Troncoso, Darwiniana 16: 618--621, fig. 3. 1971.

VITEX SCHUNKEI Moldenke, sp. nov.

Arbor, foliis 5-foliolatis, foliolis chartaceis oblong-elongatis usque ad 22 cm. longis juventute adpresso cinereis maturitate glabratis nitidisque margine obscure denticulatis; inflorescentiis cymosis, cymis parvis, pedunculis 2.5--3 cm. longis minutissime puberulis, pedicellis usque ad 2 mm. longis adpresse puberulis, calyce campanulato 1 mm. longo 2 mm. lato adpresso-puberulente, corolla hypocrateriforme, tubo ca. 5 mm. longo.

Tree, about 8 m. tall; branchlets and twigs rather slender, gray, glabrate; leaves decussate-opposite, 5-foliolate, long-petiolate; petioles ca 12 cm. long on mature leaves, angular-furrowed, very minutely and obscurely appressed-puberulent or subglabrate; leaflets 5, chartaceous when mature, unequal, 10.5--22 cm. long when mature and 4--6 cm. wide, elongate-oblong, long-acuminate at the apex and base (the base simulating a winged petiolule), glabrous and shiny above, glabrate or subglabrate beneath (the puberulence extremely minute and obscure, discernible only under a lens), more densely and visibly appressed-puberulent with ashy-gray hairs beneath when very immature; inflorescence cymose, abundant, crowded on the youngest twigs; peduncles slender, 2.5--3 cm. long, flattened and nigrescent in drying, very minutely puberulent; cymes small, few-flowered, about 1.5 cm. long and wide; pedicels filiform, to 2 mm. long, appressed-puberulent; calyx

campanulate, about 1 mm. long and 2 mm. wide, appressed-puberulent; corolla hypocrateriform, its tube slender, cylindric, about 2 mm. long, densely appressed-puberulent on the outside, more conspicuously so upwards, the limb about 8 mm. wide, densely puberulent on both surfaces.

The type of this species was collected by José Schunke V. (no. 908) in a low forest in Neshuya, at 250 m. altitude, Loreto, Peru, on October 2, 1965, and is deposited in the Britton Herbarium at the New York Botanical Garden. The collector describes the color of the corollas as "2.5P5/8".

ADDITIONAL NOTES ON THE GENUS VERBENA. XI

Harold N. Moldenke

VERBENA [Dorst.] L.

Additional synonymy: Veraena Lam. ex Tawada, Biol. Mag. Okinawa [Okinawa Seibutsugakki] 4 (6): 36, sphalm. 1967.

Additional & emended bibliography: Matth., Disc. Valgr., ed. 1, 2: 399 & 1107 (1585) and ed. 2, 2: 1107. 1586; Schröder, Pharm. Med.-Chem., ed. 2, 4: 167--168. 1649; Micheli, Cat. Plant. Hort. Caes. Florent., ed. 1, 98 & 182. 1748; Lanfossi, Giorn. Fis. Chim. Stor. Nat. Med. & Art., ser. 2, 10: 48. 1827; Micheli, Cat. Plant. Hort. Caes., Florent., ed. 2, 98 & 182. 1831; Jan, Elench. Pl. 1. 1831; Moris, Fl. Sard. 3: 342--343. 1859; P. M. Rodríguez, Pl. Med. Parag. 1915; Tischler, Tabul. Biol. 4: 24. 1927; Furusato, Bot. & Zool. Theoret. & Appl. Tokyo 8: 1303--1311. 1940; Covas & Schnack, Revist. Argent. Agron. 14: 229 & 231, fig. 32. 1947; Darlington & Wylie, Chrom. Atl., pr. 1, 322--323 & 518. 1956; Schnack, Fehleisen, & Cocucci, Revist. Argent. Agron. 24: 129--135. 1957; Cabrera, Revist. Invest. Agríc. 11: 332 & 398. 1957; Rattenbury, Madroño 15: 50--51. 1959; Schnack, Fehleisen, & Cocucci, Revist. Fac. Agron. La Plata 35: [47]--56, fig. 1--3. 1959; Lems, Sarracenia 5: 79. 1960; Lewis & Oliv., Am. Journ. Bot. 48: 638--643, fig. 1--26. 1961; Martin & Barkley, Seed Ident. Man. 37, 58, 194--195, & 221, fig. 260, pl. 234--236 & 397. 1961; Rattenbury, Madroño 17: 116. 1963; Ruiz Leal, Revist. Facult. Cienc. Agrar. Mendoza 11: 173 & 174, fig. 8. 1964; Banerji, Rec. Bot. Surv. India 19: 75. 1965; Huynh, Schweiz. Naturforsch. Ges. Mém. Soc. Helvet. Sci. Nat. 85: 1--178. 1965; Tawada, Biol. Mag. Okinawa [Okinawa Seibutsugakki] 4 (6): 36--37. 1967; T. H. Everett, Living Trees World 297. 1968; M. Martinez, Pl. Med. Mex., ed. 5, 340--341, 505, & 579. 1969; Bolkh., Grif, Matvej., & Zakhar., Chrom. Numb. Flow. Pl. 715--717. 1969; Angely, Fl. Anal. Fitogeogr. Est. S. Paulo, ed. 1, 4: 825, 838--840, & xix. 1970; Troncoso, Darwiniana 16: [613]--621, fig. 1--3. 1971; Vyas & Agarwal, Phyton 28: 1--5. 1971; Anon., Biol. Abstr. 53 (1): B.A.S.I.C. S.

267. 1972; D. Burpee, Burpee Seeds 1972: 1, 28, 56, & 57, pl. 3177 & 4345. 1972; W. J. Park, Park's Flower Book 1972: 87. 1972; Vyas & Agarwal, Biol. Abstr. 53: 499. 1972; Moldenke, Phytologia 23: 191--196. 1972.

Additional excluded species are:

Verbena foemina Brunf. = Senecio vulgaris L., Carduaceae

Verbena foemina Trag. = Sisymbrium officinale L., Brassicaceae

Verbena recta sive mas Fuchs = Sisymbrium officinale L., Brassicaceae

The Tawada reference in the bibliography above is sometimes cited as "1968", but the date, December 25, 1967, appears both on the title-page of the number and on the first page of Tawada's paper. The Madroño references (1959, 1960, 1962) are sometimes cited as "Solbrig, Madroño...." or "Darlington, Document. Chrom. Numb. Pl.....", but actually are in several continuations of Rattenbury's original enumeration, with no new author or compiler indicated. The Tischler (1927) reference is sometimes cited as "Tischler, Pflanzl. Chrom....."

VERBENA ABRAMSI Moldenke

Additional bibliography: Moldenke, Fifth Summ. 1: 65 (1971) and 2: 649, 679, & 912. 1971; Moldenke, Phytologia 22: 458--459. 1972.

xVERBENA ADULTERINA Hausskn.

Additional bibliography: Moldenke, Fifth Summ. 1: 206 (1971) and 2: 686, 699, 710, & 912. 1971; Moldenke, Phytologia 23: 459. 1972.

VERBENA ALATA Sweet

Additional synonymy: Verbena elata Jan, Elench. Pl. 1. 1824.

Additional bibliography: Jan, Elench. Pl. 1. 1824; Moldenke, Fifth Summ. 1: 177, 189, & 369 (1971) and 2: 649 & 912. 1971; Moldenke, Phytologia 22: 459. 1972.

VERBENA ALATA f. ALBA Moldenke

Additional bibliography: Moldenke, Fifth Summ. 1: 177 (1971) and 2: 912. 1971; Moldenke, Phytologia 22: 459. 1972.

VERBENA AMBROSIFOLIA Rydb.

Additional bibliography: Bolkh., Grif, Matvej., & Zakhar., Chrom. Numb. Flow. Pl. 716. 1969; Moldenke, Phytologia 23: 182, 188, & 190. 1972.

VERBENA AMBROSIFOLIA f. EGLANDULOSA Perry

Additional bibliography: Bolkh., Grif, Matvej., & Zakhar., Chrom. Numb. Flow. Pl. 716. 1969; Moldenke, Fifth Summ. 1: 50, 52, 57, 61, 63, & 74 (1971) and 2: 649, 650, 658, & 912. 1971; Moldenke, Phytologia 22: 461--462 (1972) and 23: 188 & 190. 1972.

VERBENA AMOENA Paxt.

Additional bibliography: Moldenke, Fifth Summ. 1: 74 & 399 (1971) and 2: 672 & 912. 1971; Moldenke, *Phytologia* 22: 462. 1972.

VERBENA ANDALGALENSIS Moldenke

Additional bibliography: Moldenke, Fifth Summ. 1: 200 (1971) and 2: 912. 1971; Moldenke, *Phytologia* 22: 462. 1972.

VERBENA ANDRIEUXII Schau.

Additional bibliography: Moldenke, Fifth Summ. 1: 74, 205, & 369 (1971) and 2: 651 & 912. 1971; Moldenke, *Phytologia* 22: 463. 1972.

VERBENA ARENARIA Moldenke

Additional bibliography: Moldenke, Fifth Summ. 1: 200 (1971) and 2: 912. 1971; Moldenke, *Phytologia* 22: 463. 1972.

xVERBENA ARGENTINA Moldenke

Additional bibliography: Moldenke, Fifth Summ. 1: 200 (1971) and 2: 912. 1971; Moldenke, *Phytologia* 22: 463. 1972.

VERBENA AURANTIACA Spag.

Additional bibliography: Moldenke, Fifth Summ. 1: 192 & 200 (1971) and 2: 912. 1971; Moldenke, *Phytologia* 22: 463 & 464. 1972.

VERBENA AURANTIACA var. *GLABERRIMA* Moldenke

Additional bibliography: Moldenke, Fifth Summ. 1: 200 (1971) and 2: 912. 1971; Moldenke, *Phytologia* 22: 464--465. 1972.

VERBENA AURANTIACA f. *ROSEA* Moldenke

Additional bibliography: Moldenke, Fifth Summ. 1: 200 (1971) and 2: 912. 1971; Moldenke, *Phytologia* 22: 465. 1972.

VERBENA AUSTRALIS Moldenke

Additional bibliography: Moldenke, Fifth Summ. 1: 177 (1971) and 2: 912. 1971; Moldenke, *Phytologia* 22: 465. 1972.

xVERBENA BAILEYANA Moldenke

Additional bibliography: Moldenke, Fifth Summ. 1: 369 (1971) and 2: 672, 673, 686, 697, 700, 702, & 912. 1971; Moldenke, *Phytologia* 22: 465. 1972.

VERBENA BAJACALIFORNICA Moldenke

Additional bibliography: Moldenke, Fifth Summ. 1: 74 (1971) and 2: 912. 1971; Moldenke, *Phytologia* 22: 465. 1972.

VERBENA BALANSAE Briq.

Additional bibliography: Moldenke, Fifth Summ. 1: 177, 187, & 200 (1971) and 2: 702 & 912. 1971; Moldenke, *Phytologia* 22: 465. 1972.

Recent collectors have found this plant fruiting in September

and December, growing in "pastizal" and on high campos with Butia yatay (Mart.) Becc. The corollas are described as "blue" on Krapovickas, Cristóbal, Arbo, Maruñak, Maruñak, & Irogoyen 17113 and "clear lilac" on Krapovickas & Cristóbal 16028.

Additional citations: ARGENTINA: Corrientes: Krapovickas & Cristóbal 16028 (Rf); Krapovickas, Cristóbal, Arbo, Maruñak, Maruñak, & Irogoyen 17113 (Ac).

VERBENA BALLSII Moldenke

Additional bibliography: Moldenke, Fifth Summ. 1: 200 (1971) and 2: 912. 1971; Moldenke, Phytologia 22: 465. 1972.

VERBENA BANGIANA Moldenke

Additional bibliography: Moldenke, Fifth Summ. 1: 184 (1971) and 2: 912. 1971; Moldenke, Phytologia 22: 465. 1972.

VERBENA BARBATA Grah.

Additional bibliography: Moldenke, Fifth Summ. 1: 74 (1971) and 2: 653 & 912. 1971; Moldenke, Phytologia 22: 466. 1972.

xVERBENA BEALEI Moldenke

Additional bibliography: Moldenke, Fifth Summ. 1: 369 (1971) and 2: 674, 680, & 912. 1971; Moldenke, Phytologia 22: 466. 1972.

VERBENA BERTERII f. ALBIFLORA Moldenke

Additional bibliography: Moldenke, Fifth Summ. 1: 143 & 192 (1971) and 2: 653 & 912. 1971; Moldenke, Phytologia 22: 466. 1972.

xVERBENA BINGENENSIS Moldenke

Additional bibliography: Moldenke, Fifth Summ. 1: 64 (1971) and 2: 656, 679, & 912. 1971; Moldenke, Phytologia 22: 466--467. 1972.

VERBENA BIPINNATIFIDA Nutt.

Additional synonymy: Verbena bipinnatifolia Nutt. ex Bolkh., Grif, Matvej., & Zakhar., Chrom. Numb. Flow. Pl. 716, sphalm. 1969.

Additional & emended bibliography: Lewis & Oliv., Am. Journ. Bot. 48: [639]--641, fig. 6. 1961; Rattenbury, Madroño 16: 267. 1962; Bolkh., Grif, Matvej., & Zakhar., Chrom. Numb. Flow. Pl. 716. 1969; Vyas & Agarwal, Phytos 28: 1--5. 1971; Moldenke, Fifth Summ. 1: 27, 32, 33, 36, 41, 43, 45, 47, 49, 51, 52, 57, 61, 63, 74, & 369 (1971) and 2: 521, 652--654, 658, 665, 671, 690, 708, & 912. 1971; Moldenke, Phytologia 22: 460, 461, 467--474, & 497 (1972) and 23: 188 & 190. 1972; Vyas & Agarwal, Biol. Abstr. 53: 499. 1972; Anon., Biol. Abstr. 53 (1): B.A.S.I.C. S.267. 1972.

Emended illustrations: Lewis & Oliv., Am. Journ. Bot. 48: 640, fig. 6. 1961.

Solbrig (1962) reports the chromosome number for this species as $2n = 30$. In this he agrees with Lewis & Oliver (1961), but

disagrees with his own previous finding which may have been based on a misidentification or on a specimen representing one of the many forms which have at times been given taxonomic standing. If the latter is the case, this would be most important information.

The Madroño (1962) reference in the bibliography above is cited as "Darlington, Document. Chrom. Numb. Pl. 1962" by Bolkhovskikh and his associates (1969).

Vyas & Agarwal (1971) report on the effect of thiourea and ascorbic acid on the seed germination of this species, both individually and jointly. The seeds are positively photoblastic and possess embryo dormancy. Both positively photoblastic and ascorbic acid at 200 ppm. concentration have a promoting effect. Thiourea makes the seeds light-indifferent, while ascorbic acid causes negative photoblastic response in these seeds. Two roles of ascorbic acid have been observed: one is the synergism with thiourea in stimulating germination and the other is the antagonism to the stimulatory effect of thiourea in light. It is most probable that the plant used by these authors was V. tenuisecta Briq., not V. bipinnatifida as they claim.

The corollas are described as having been "purple" on Perino & Perino 429.

Additional citations: OKLAHOMA: Roger Mills Co.: Perino & Perino 429 (Au--302808). MEXICO: Chihuahua: Townsend & Barber 139 (Au--292048).

VERBENA BIPINNATIFIDA var. LATILOBATA Perry

Additional bibliography: Moldenke, Fifth Summ. 1: 45, 53, 57, 61, 63, 74, & 369 (1971) and 2: 654 & 912. 1971; Moldenke, *Phytologia* 22: 473--474. 1972.

xVERBENA BLANCHARDI Moldenke

Additional bibliography: Moldenke, Fifth Summ. 1: 16, 21, 34, 38, 43, 53, & 369 (1971) and 2: 651, 654, 672--674, 695, & 912. 1971; Moldenke, *Phytologia* 22: 474. 1972.

VERBENA BONARIENSIS L.

Additional & emended bibliography: Jan, *Elench. Pl.* 1. 1824; Noack, *Biol. Zentralbl.* 57: 383--388. 1937; Rosengurtt, *Estud. Prad. Nat. Urug.* 3: 325 & 326. 1943; Covas & Schnack, *Revist. Argent. Agron.* 14: 229. 1947; Schnack, Fehleisen, & Cocucci, *Revist. Fac. Agron. La Plata* 35: 49, [54], & 55, fig. 3. 1959; Lems, *Sarcenia* 5: 79. 1960; Bolkh., Grif, Matvej., & Zakhar., *Chrom. Numb. Flow. Pl.* 716. 1969; Moldenke, *Phytologia* 23: 182. 1972.

Additional illustrations: Schnack, Fehleisen, & Cocucci, *Revist. Fac. Agron. La Plata* 35: [54], fig. 3. 1959.

Walker found this species in low waste places on Okinawa. Lems (1960) records it from thickets with Arundo donax on Gomera and Tenerife islands of the Canaries and cites Lems 2806. Schnack and his associates (1959) report that V. bonariensis is apomictic in its natural reproduction.

Additional citations: ARGENTINA: Buenos Aires: Erizuela 1459 (Au--121764), 1564 (Au--121757), 1638 (Au--121758). RYUKYO ISLAND ARCHIPELAGO: Okinawa: E. H. Walker 8133 (W--2619388).

VERBENA BONARIENSIS f. ALBIFLORA Moldenke

Additional bibliography: Moldenke, Fifth Summ. 1: 177 & 200 (1971) and 2: 912. 1971; Moldenke, Phytologia 22: 479. 1972.

VERBENA BONARIENSIS var. CONGLOMERATA Briq.

Additional bibliography: Moldenke, Fifth Summ. 1: 16, 25, 39, 65, 92, 177, 187, 189, 200, 350, & 369 (1971) and 2: 912. 1971; Moldenke, Phytologia 22: 478 & 479. 1972.

VERBENA BRACTEATA Lag. & Rodr.

Additional & emended bibliography: Jan, Elench. Pl. 1. 1824; Reiche & Phil., Fl. Chil. 5: 296. 1910; Graves, Eames, Bissell, Andrews, Harger, & Weatherby, Bull. Conn. Geol. & Nat. Hist. Surv. 14: [Cat. Flow. Pl.] 331. 1910; Noack, Biol. Zentralbl. 57: 383--388. 1937; Rattenbury, Madroño 15: 51 (1959) and 15: 220. 1960; Bolkh., Grif, Matvej., & Zakhar., Chrom. Numb. Flow. Pl. 716. 1969; Moldenke, Fifth Summ. 1: 15--19, 21--23, 27, 30, 32, 34, 36--43, 45, 47, 49--51, 53, 57, 63--65, 75, 203--205, 369, & 396 (1971) and 2: 656, 657, 659, 664, 672, 673, 677, 679, 691, 693, 697, 698, 705, 736, 766, 913, & 967. 1971; Moldenke, Phytologia 22: 461, 467, 479--488, 490, 499, & 501 (1972) and 23: 188, 195, & 196. 1972.

The Madroño (1959, 1960) references given in the bibliography above are sometimes attributed to Solbrig, while Bolkhovskikh and his associates (1969) cites them as "Darlington, Document. Chrom. Numb. Pl...." Actually they appear in the periodic continuation of a series started by Rattenbury, with no more subsequent compiler mentioned.

The corollas of V. bracteata are described as "very pale-violet, tube purplish" on Twisselmann 8948. Twisselmann reports the plant as "locally common in low areas flooded by May and June storms in the Lower Sonoran grasslands" of Kern County, California. The R. M. Stewart 1180, distributed as V. bracteata, is actually V. plicata Greene.

Additional citations: CALIFORNIA: Kern Co.: Twisselmann 8948 (Au--297797).

VERBENA BRACTEATA f. ALBIFLORA (Cockerell) Moldenke

Additional bibliography: Moldenke, Fifth Summ. 1: 51 & 64 (1971) and 2: 657 & 913. 1971; Moldenke, Phytologia 22: 488. 1972.

VERBENA BRASILIENSIS Vell.

Additional & emended bibliography: Lewis & Oliv., Am. Journ. Bot. 48: [639]--641, fig. 22. 1961; Bolkh., Grif, Matvej., & Zakhar., Chrom. Numb. Flow. Pl. 716. 1969; Moldenke, Phytologia 23: 182. 1972.

Emended illustrations: Lewis & Oliv., Am. Journ. Bot. 48: 640, fig. 22. 1961.

Recent collectors describe this as an erect perennial herb, to 1.5 m. tall, growing in hedgerows and cultivated fields. Ellison found it an "abundant population on roadbanks of train track in disturbed habitat, full sun" in North Carolina. The corollas were "lavender" on Ellison 817 and "purple" on Mexia 5275.

Additional citations: BRAZIL: Minas Gerais: Mexia 5275 (Au--121763). São Paulo: I. S. Gottsberger 143 [4] (Ft).

VERBENA BRASILIENSIS var. SUBGLABRATA Moldenke

Additional bibliography: Moldenke, Fifth Summ. 1: 192 (1971) and 2: 913. 1971; Moldenke, Phytologia 22: 490. 1972.

VERBENA CALIFORNICA Moldenke

Additional bibliography: Moldenke, Fifth Summ. 1: 65 & 370 (1971) and 2: 913. 1971; Moldenke, Phytologia 22: 490--491. 1972.

VERBENA CALLIANTHA Briq.

Additional bibliography: Moldenke, Fifth Summ. 1: 177, 184, 187, & 200 (1971) and 2: 658, 662, 667, 683, & 913. 1971; Moldenke, Phytologia 22: 491. 1972.

VERBENA CALLIANTHA var. MICROSONA Briq.

Additional bibliography: Moldenke, Fifth Summ. 1: 187 (1971) and 2: 913. 1971; Moldenke, Phytologia 22: 491. 1972.

VERBENA CAMERONENSIS L. I. Davis

Additional & emended bibliography: Lewis & Oliv., Am. Journ. Bot. 48: [639]--641, fig. 7. 1961; Bolkh., Grif, Matvej., & Zakhar., Chrom. Numb. Flow. Pl. 716. 1969; Moldenke, Fifth Summ. 1: 57 & 75 (1971) and 2: 658, 682, & 913. 1971; Moldenke, Phytologia 22: 491--492. 1972.

Emended illustrations: Lewis & Oliv., Am. Journ. Bot. 48: 640, fig. 7. 1961.

Johnston and Davis collected this plant on the coastal lowlands of Veracruz, Mexico, in 1946 and comment that this was "apparently the first record from Veracruz", but this statement is obviously incorrect since the species was collected in that Mexican state by Henri Guillaume Galeotti in 1840 -- 106 years earlier!

Additional citations: MEXICO: San Luis Potosí: Davis & Johnston s.n. [13 April 1946] (Au--278272). Veracruz: Johnston & Davis s.n. [20 April 1946] (Au--278281).

VERBENA CAMPESTRIS Moldenke

Additional bibliography: Moldenke, Fifth Summ. 1: 177 (1971) and 2: 912. 1971; Moldenke, Phytologia 22: 492. 1972.

VERBENA CANADENSIS (L.) Britton

Additional & emended bibliography: Jan, Elench. Pl. 1. 1824;

Noack, Biol. Zentralbl. 57: 383--388. 1937; Rattenbury, Madroffo 15: 51. 1959; Bolkh., Grif, Matvej., & Zakhar., Chrom. Numb. Flow. Pl. 715 & 716. 1969; Moldenke, Phytologia 23: 183. 1972.

There is disagreement among cytologists as to the chromosome number in this species. It is given as 30 by Junell (1934), Dermen (1936), Noack (1937), and Solbrig (1959), but as 10 by Sharma & Mukhopadhyay (1963). It would be most interesting to see if herbarium vouchers were kept by these workers and then to ascertain whether the last-mentioned report is not perhaps based on a misidentification. Verbena tenuisecta Briq., a commonly cultivated and escaped species, is the one that is most often misidentified in India.

The Madroffo reference cited in the bibliography above is often credited to Solbrig, while Bolkhovskikh (1969) cites it as "Darlington, Document. Chrom. Numb. Pl."

The corollas are described as having been "purple" on Perino & Perino 377 and these collectors describe the plant as "common" in Pushmataha County, Oklahoma.

The Kibler 26, distributed as V. canadensis, is actually V. halei Small.

Additional citations: OKLAHOMA: Pushmataha Co.: Perino & Perino 377 (Au--302806).

VERBENA CANADENSIS f. CANDIDISSIMA (Haage & Schmidt) Palmer & Steyererm.

Additional bibliography: Moldenke, Fifth Summ. 1: 43, 45, 58, & 370 (1971) and 2: 653, 658, 659, 784, & 913. 1971; Moldenke, Phytologia 22: 498. 1972.

VERBENA CANESCENS H.B.K.

Additional bibliography: Lewis & Oliv., Am. Journ. Bot. 48: [639]- & 641. 1961; Bolkh., Grif, Matvej., & Zakhar., Chrom. Numb. Flow. Pl. 716. 1969; Moldenke, Fifth Summ. 1: 51, 58, & 75 (1971) and 2: 659--661, 684, 694, 767, 769, & 913. 1971; Moldenke, Phytologia 22: 485 & 498--501. 1972.

Lewis & Oliver (1961) report the diploid chromosome number for this species as 14. Recent collectors have found it growing in matorral formation in Mexico. The corollas are described as "purple" on Ventura A. 1574.

Additional citations: MEXICO: Oaxaca: Johnston & Davis s.n. [27 July 1947] (Au--278287). Puebla: Ventura A. 1574 (Au--294666).

VERBENA CANESCENS f. ALBIFLORA Moldenke

Additional bibliography: Moldenke, Fifth Summ. 1: 75 (1971) and 2: 913. 1971; Moldenke, Phytologia 22: 500. 1972.

VERBENA CANESCENS var. ROEMERIANA (Scheele) Perry

Additional & emended bibliography: Lewis & Oliv., Am. Journ. Bot. 48: [639]--641, fig. 13. 1961; Moldenke, Fifth Summ. 1: 58,

65, & 75 (1971) and 2: 659--661, 693, 702, & 913. 1971; Moldenke, *Phytologia* 22: 485 & 499--501. 1972.

Emended illustrations: Lewis & Oliv., *Am. Journ. Bot.* 48: 640, fig. 13. 1961.

Recent collectors describe this plant as a perennial and found it growing on gravelly knolls. The corollas are described as having been "blue" on Rollins & Tryon 5841.

Additional citations: MEXICO: Nuevo León: Rollins & Tryon 5841 (Au--300250).

VERBENA CANIUENSIS Moldenke

Additional bibliography: Moldenke, *Fifth Summ.* 1: 177 (1971) and 2: 660 & 913. 1971; Moldenke, *Phytologia* 22: 501. 1972.

VERBENA CAROLINA L.

Additional bibliography: Jan, *Elench. Pl.* 1. 1824; Lewis & Oliv., *Am. Journ. Bot.* 48: [639]--641, fig. 14. 1961; Bolkh., Grif, Matvej., & Zakhar., *Chrom. Numb. Flow. Pl.* 716. 1969; Moldenke, *Phytologia* 23: 183--186. 1972.

Emended illustrations: Lewis & Oliv., *Am. Journ. Bot.* 48: 640, fig. 14. 1961.

Runyon describes this plant as "common in waste places" in the state of México. The corollas are said to have been "purple" on R. Runyon 1360.

Additional citations: MEXICO: México: R. Runyon 1360 (Au--290200). Oaxaca: Johnston & Davis s.n. [1 July 1947] (Au--278268).

VERBENA CILIATA Benth.

Additional & emended bibliography: Lewis & Oliv., *Am. Journ. Bot.* 48: [639]--641, fig. 8. 1961; Bolkh., Grif, Matvej., & Zakhar., *Chrom. Numb. Flow. Pl.* 716. 1969; Moldenke, *Phytologia* 23: 186--190 & 192. 1972.

Emended illustrations: Lewis & Oliv., *Am. Journ. Bot.* 48: 640, fig. 8. 1961.

The J. Rzedowski 4344, distributed as V. ciliata, is actually V. elegans H.B.K.

Additional citations: MEXICO: Chihuahua: Pennington 42 (Au--287710). Nuevo León: Kenoyer C.48 (Au--122037).

VERBENA CLOVERAE Moldenke

Additional & emended bibliography: Lewis & Oliv., *Am. Journ. Bot.* 48: [639]--641, fig. 15. 1961; Bolkh., Grif, Matvej., & Zakhar., *Chrom. Numb. Flow. Pl.* 716. 1969; Moldenke, *Phytologia* 23: 190 & 192--193. 1972.

VERBENA CORYMBOSA Ruiz & Pav.

Additional bibliography: Bolkh., Grif, Matvej., & Zakhar., *Chrom. Numb. Flow. Pl.* 716. 1969; Moldenke, *Phytologia* 23: 194. 1972.

VERBENA CUMINGII Moldenke

Additional bibliography: Moldenke, Phytologia 13: 191. 1966; Moldenke, Fifth Summ. 1: 192 (1971) and 2: 621 & 914. 1971.

VERBENA DELTICOLA Small

Additional & emended bibliography: Lewis & Oliv., Am. Journ. Bot. 48: [639]--641, fig. 9 & 10. 1961; Bolkh., Grif, Matvej., & Zakhar., Chrom. Numb. Flow. Pl. 716. 1969; Moldenke, Phytologia 23: 196. 1972.

Emended illustrations: Lewis & Oliv., Am. Journ. Bot. 48: 640, fig. 9 & 10. 1961.

Recent collectors have found this plant growing in roadside ditches, in mountain meadows, and in Acacia-Prosopis communities, often in dark soil. Runyon describes it as an "erect or ascending herb, in open ground, occasionally along highways, clay soil, the flowers with no odor, blooming in April and May, the leaves nearly trifid, ovate in outline, fruit a small capsule [actually it is a schizocarp], bark green, roots fibrous" and "flowers in terminal panicles [actually spikes], growing in sandy loam of open ground and fields, the leaves ovate in outline, lobed, abundant, forms colonies sometimes covering large areas."

Fleetwood reports that it is "common in dry clayey loam" in Hidalgo County, Texas, while Ton has found it on shrubby and steep heavily wooded slopes in Chiapas -- the latter a notable southward extension of the known range of the species! Sikes & Babcock report it as "abundant" in Sonora. Rickett (1969) avers that it blossoms in Texas from February to August, growing "in sandy or clay soil in open ground, often very profuse, in southern Texas and northern Mexico". He describes the corollas as ranging "from pink to magenta, lavender, and purple". Pennington tells us that in Sonora the plant is boiled and salted.

The corolla is described as "light-blue" on Sikes & Babcock 161, "pink-purple" on C. L. Lundell 10680, "red" on R. Runyon 2587, and "purple" on R. Runyon 2625.

Material of V. delticola has been misidentified and distributed in herbaria as V. stricta Vent., while the Pladeck s.n. [May 5, 1940], distributed as V. delticola, is actually V. cloverae Moldenke and Pennington 27 is xV. hybrida Voss.

Additional citations: TEXAS: Cameron Co.: C. L. Lundell 10680 (N); R. Runyon 2587 (Au--268721). Hidalgo Co.: Fleetwood 8157 (W--2518783); R. Runyon 2625 (Au--268719). MEXICO: Chiapas: Ton 1863 (Z), 2210 (Rf). Coahuila: E. G. Marsh 1184 (Au--212082), 1592 (Au--213301), 2147 (Au--213883). Hidalgo: V. H. Chase 7116 (N); Johnston & Davis s.n. [17 April 1946] (Au--278290). Nuevo León: Atwood 2059 (N); Diaz L. s.n. [10/IX/1959] (Ip), s.n. [16. IX.1959] (Ip); L. C. Higgins 2683 (Mi); Johnston & Davis s.n. [7 April 1946] (Au--278279, Au--278291); H. M. Parker 501 (Au--302752). Sonora: Pennington 312 (Au--264257); Sikes & Babcock

161 (Au--259161, Au--284540), Tamaulipas: Stanford, Lauber, & Taylor 2100 (Se--149132).

VERBENA DELTICOLA f. LILACINA L. I. Davis

Additional synonymy: Verbena delticola lilacina L. I. Davis ex Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. Bot. 6:] 1876. 1970.

Additional bibliography: Moldenke, Phytologia 9: 64--65. 1963; Moldenke in Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. Bot. 6:] 1316 & 1323. 1970; Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. Bot. 6:] 1876. 1970; Moldenke, Fifth Summ. 1: 58 (1971) and 2: 665 & 914. 1971.

VERBENA DEMISSA Moldenke

Additional bibliography: Moldenke, Phytologia 13: 247. 1966; Moldenke, Fifth Summ. 1: 137 (1971) and 2: 914. 1971.

This plant has been collected at altitudes of 2550 to 3700 meters, flowering and fruiting in April, July, and September. The Rose, Pachano, & Rose 22851, cited below, was previously misidentified and cited as V. glabrata H.B.K. Material has also been misidentified and distributed in some herbaria under the name V. polystachya H.B.K.

Additional citations: ECUADOR: Azuay: Asplund 17801 (N); Rose, Pachano, & Rose 22851 (N, W--1022448). Cañar: Játiva & Epling 260 (N).

xVERBENA DERMENTI Moldenke

Additional bibliography: Moldenke, Phytologia 10: 104. 1964; Moldenke, Résumé Suppl. 17: 3. 1968; Moldenke, Fifth Summ. 1: 143, 184, 187, 200, & 370 (1971) and 2: 655, 665, 674, & 914. 1971.

Steinbach describes this plant as "locally common", with the corollas "bright-violet, rose-purple at base outside". It has been collected in fruit in February and April, in addition to the months previously reported. Vargas Calderón 19493 is a mixture with V. parvula var. gigas Moldenke

Additional citations: PERU: Arequipa: López Guillén 249 (Rf); Vargas Calderón 19493, in part (Ac). Ayacucho: Soukup 5501 (Z). BOLIVIA: Cochabamba: R. F. Steinbach 64 (N). ARGENTINA: Formosa: I. Morel 4614 (N).

VERBENA DISSECTA Willd.

Additional & emended synonymy: Verbena laciniata Kuntze ex Moldenke, Suppl. List Invalid Names 9, in syn. 1941 [not V. laciniata Briq., 1960, nor (L.) Briq., 1904, nor (Lam.) Briq., 1939, nor Raf., 1833, nor Sessé & Moc., 1940]. Glandularia dissecta (Willd. ex Spreng.) Schnack & Covas apud J. A. Clark, Card Ind. Gen. Sp. Var. issue 183. 1944.

Additional & emended bibliography: Reiche & Phil., Fl. Chil. 5: 289 & 292. 1910; J. A. Clark, Card Ind. Gen. Sp. Var. issue 183.

1944; Cabrera, Man. Fl. Alred. Buenos Aires 396—398, fig. 148 f—n. 1953; J. F. Macbr., Field Mus. Publ. Bot. 13 (5): 614, 619, & 629. 1960; Martínez-Crovetto, Bonplandia 1: 291 & 314. 1964; Angely, Fl. Anal. Paran., ed. 1, 571. 1965; Martínez-Crovetto, Bonplandia 2: 19. 1965; Troncoso in Cabrera, Fl. Prov. Buenos Aires 5: 132 & 138. 1965; Meyer & Weyrauch, Inst. Mig. Lill. Misc. 23: 64 & 123. 1966; Martínez-Crovetto, Bonplandia 2: 130. 1967; Moldenke, Phytologia 16: 51. 1968; Solbrig, Passani, & Glass, Am. Journ. Bot. 55: 1238. 1968; Bolkh., Grif, Matvej., & Zakhar., Chrom. Numb. Flow. Pl. 715 & 716. 1969; R. F. V. Cooper in Pastore, Bol. Soc. Argent. Hort. 157: 124 & 125. 1969; Schnack & Rubens, Bol. Soc. Argent. Hort. 13: 206. 1970; Moldenke, Fifth Summ. 1: 177, 184, 189, 192, 200, & 370 (1971) and 2: 521, 621, 655, 662, 666, 667, 673, 700, 708, & 914. 1971.

Additional illustrations: Cabrera, Man. Fl. Alred. Buenos Aires 396, fig. 148 f—n. 1953; R. F. V. Cooper in Pastore, Bol. Soc. Argent. Hort. 157: 124. 1969.

It should be pointed out here that the Verbena laciniata (H.B.K.) Briq., referred to in the synonymy above, is a synonym of V. laciniata (L.) Briq., while V. laciniata Raf. is probably xV. perriana Moldenke.

Macbride (1960) credits V. dissecta to "Willd. ex Schauer in DC. Prodr. 11: 552. 1847", but the name actually goes back to Sprengel in L., Syst. Veg., ed. 16, 2: 750 (1825). He cites a Meyen s.n. from Pisacoma, Puno, Peru, but I doubt very much that V. dissecta occurs at all in Peru. Meyen's plant is probably V. laciniata (L.) Briq., as Macbride himself suggests. He gives the distribution of V. dissecta as "To Uruguay. Chile; Bolivia; Brazil". Troncoso (1965) gives its distribution as "Brasil meridional, Uruguay y Argentina. En praderas arenosas y en las barrancas del Paraná y del litoral bonaerense". She cites Burkart 3082 and Rodrigo 2339 in the San Isidro herbarium.

Martínez-Crovetto (1964, 1965) record the Chaco Amerind names "imalák labé (hoja azul)" and "uompé chak(o)líp" for this species; Cooper (1969) calls it "lilac verbena". The corollas are described as "rose" on B. L. Müller 152, 190, 203, & 209, "lilac" on Collector undetermined 311 and Luna 132, 241, & 547, "purple" on R. M. Aguilar 286, "bluish" on Herb. Inst. Miguel Lillo 981, "blue" on Olea 4, "blue-violet" on Semper 133, "reddish" on B. L. Müller 165, "bluish-lilac" on Varela 404, and "violet" on P. García s.n.

Additional citations: BRAZIL: Rio Grande do Sul: Palacios & Cuezco 2519 (N). ARGENTINA: Catamarca: Brizuela 628 (N), 1037 (N); B. L. Müller 152 (N), 165 (N), 190 (N); O'Donnell s.n. [IV-44] (N); Pierotti 11529 [Herb. Inst. Miguel Lillo 28312] (N), "H" [12/III/44] (N), "H" [15/V/44] (N), "h" [La Merced, 19/V/44] (N). Chaco: Buratovich 69 (N). Córdoba: Varela 404 (N); Villafañe 120 (Se-130302), 642 (N). Formosa: I. Morel 4391 (N); Pierotti 6543

(N). La Rioja: B. L. Müller 203 (N), 209 (N). Mendoza: Semper 138 (N). Salta: R. M. Aguilar 286 (N); Luna 132 (N), 547 (N); M. R. Malvárez 179 (N), 302 (N); O'Donell 3094 (N). Santiago del Estero: Balegno 103 (N); P. García s.n. [Herb. Inst. Miguel Lillo 714] (N), s.n. [Herb. Inst. Miguel Lillo 981] (N); Luna 241 (N); T. Meyer 6838 (N); Pierotti "H" [11/IV/1944] (N), "h" (N); Viet-Martínez s.n. [Herb. Inst. Miguel Lillo 5] (N). Tucumán: Collector undetermined 311 (N); M. R. Malvárez 70 (N); Olea 4 (N), 190 (N); Rocha 3818 (Au--122073).

VERBENA DISSECTA f. ALBA Moldenke

Additional bibliography: Moldenke, *Phytologia* 16: 51. 1968; Moldenke, *Fifth Summ.* 1: 200 & 370 (1971) and 2: 914. 1971.

xVERBENA DISSOLUTA Moldenke

Additional bibliography: Moldenke, *Phytologia* 11: 455. 1965; Moldenke, *Fifth Summ.* 1: 370 (1971) and 2: 521, 667, 678, 689, 700, & 914. 1971.

VERBENA DOMINGENSIS Urb.

Additional bibliography: Ciferri, *Mycopathologia* 7: 89. 1954; Hansford, *Sydowia Ann. Myc.*, ser. 2, Beih. 2: 684. 1961; Moldenke, *Phytologia* 11: 455. 1965; Moldenke, *Fifth Summ.* 1: 98 & 370 (1971) and 2: 666, 686, & 914. 1971.

Recent collectors describe this plant as slender, herbaceous, erect, and 30--50 cm. tall, or sometimes decumbent, the rhizome creeping. The corollas are described as having been "violet" on Gastory, Jones, & Norris 363 and Liogier 12077 & 12197 and "blue" on Holdridge 834 and Jiménez 4831. The species has been found along trails through rocky pine forests; Liogier found it "in open places near rivers.....in mostly secondgrowth vegetation" and calls it "common in pine barrens in rocky mountains". It has been collected at altitudes of 500 to 2710 meters. The cultivated material from California was grown from seeds of Liogier 12077 and 12197.

Ciferri (1954) records the fungus, Meliola aciculosa var. verbenae Cif., from this host plant on the basis of Ekman 3161 from Hispaniola.

Additional citations: HISPANIOLA: Dominican Republic: Gastory, Jones, & Norris 363 (N, N); Jiménez 4831 (N); Liogier 12077 (N, N, N, Z), 12197 (N, Rf). Haiti: Holdridge 834 (Sd--61805). CULTIVATED: California: A. R. Moldenke 3395 (Ac, Z).

VERBENA DUSENII Moldenke

Additional bibliography: Angely, *Fl. Anal. Paran.*, ed. 1, 571. 1965; Moldenke, *Phytologia* 13: 194. 1966; Moldenke, *Fifth Summ.* 1: 177 (1971) and 2: 914. 1971.

Hatschbach 17637 is described by the collector as having had violet flowers "dos brejos".

Additional citations: BRAZIL: Paraná: Hatschbach 17637 (Ft, W-2536534).

VERBENA EHRENBURGIANA Schau.

Additional & emended bibliography: Howell & McClintock in Kearney & Peebles, Ariz. Fl., ed. 2, 726 & 727. 1960; Lewis & Oliv., Am. Journ. Bot. 48: [639]. 1961; Hocking, Excerpt. Bot. A. 6: 91. 1963; Moldenke, Phytologia 16: 186--187. 1968; Bolkh., Grif, Matvej., & Zakhar., Chrom. Numb. Flow. Pl. 716. 1969; Gibson, Fieldiana Bot. 24 (9): 232. 1970; Rickett, Wild Fls. U. S. 4 (3): 540 & 799. 1970; Moldenke, Fifth Summ. 1: 63 & 75 (1971) and 2: 667 & 914. 1971; Moldenke, Phytologia 23: 184. 1972.

The only record of this species from the United States is a sheet of Stalmach 198 in the herbarium of the University of Texas labeled merely "Arizona". Gibson (1970) states that all Guatemalan specimens so identified are actually V. carolina L.

Verbena ehrenburgiana has been found growing in association with Cerastium, Llavea, Penstemon, and Romanschultzia in Hidalgo, Mexico. Sullivan found it growing in humid Quercus-Liquidambar forests on limestone karst topography in Tamaulipas, flowering in June.

Material of this species has frequently been misidentified and distributed in some herbaria under the names V. urticaefolia L. or V. urticifolia L. On the other hand, the Mears 492, distributed as V. ehrenburgiana, is actually V. litoralis H.B.K.

Additional citations: MEXICO: Hidalgo: Mears 299a (Au--254970). Tamaulipas: J. R. Sullivan 409 (Au--298185), 475 (Au--298182), 554 (Au--298174). State undetermined: Schnée s.n. [Mexique, VI-X] (Mi, N, S, W--2546669).

VERBENA ELEGANS H.B.K.

Additional synonymy: Verbena elegans Humb. & Bonpl. ex Steud., Nom. Bot. Phan., ed. 1, 873. 1821. Glandularia elegans H.B.K. ex Solbrig, Passani, & Glass, Am. Journ. Bot. 55: 1235. 1968. Verbena elegans (H.B.K.) Raf. ex Moldenke, Résumé Suppl. 18: 14, in syn. 1969. Glandularia elegans Solbrig, Princ. & Meth. Pl. Biosystem. 148. 1970.

Additional bibliography: Steud., Nom. Bot. Phan., ed. 1, 873. 1821; Lewis & Oliv., Am. Journ. Bot. 48: [639] & 641, fig. 11. 1961; Hocking, Excerpt. Bot. A. 6: 91. 1963; Moldenke, Phytologia 16: 187. 1968; Solbrig, Passani, & Glass, Am. Journ. Bot. 55: 1235--1239. 1968; Bolkh., Grif, Matvej., & Zakhar., Chrom. Numb. Flow. Pl. 716. 1969; Solbrig, Passani, & Glass, Biol. Abstr. 50: 4451. 1969; Syngae, Suppl. Dict. Gard., ed. 2, 548. 1969; El-Gazzar & Wats., New Phytol. 69: 483 & 485. 1970; Moldenke in Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. Bot. 6:] 1316, 1317, & 1323. 1970; Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. Bot. 6:] 1876. 1970; Solbrig, Princ. & Meth. Pl. Biosystem. 148. 1970; Moldenke, Fifth Summ. 1:

63, 75, 205, & 370 (1971) and 2: 521, 658, 667, 679, 684, & 914. 1971; Moldenke, *Phytologia* 22: 461 & 471. 1972.

Recent collectors have encountered this plant on very wet slopes, riolitic slopes with disturbed oak vegetation, coniferous woods, in oak forests on wet mountainsides, on grassy slopes with Quercus, and on limestone mountains, as well as in oak woods and in Abies woods, at altitudes of 1000 to 3230 meters. Mears found it growing in association with Cornus, Drymaria, Dudleya, Heuchera, Lobelia, Maurandya, Piqueria, and Reseda, the Andersons refer to it as a "common roadside herb", and Beaman found it to be "common on open meadows in pine forests". It has been collected in fruit in November, in addition to the months previously reported in these notes. The vernacular name, "verbena", has been recorded for it. A tea made from the leaves is taken for stomach disorders in Chihuahua.

The corollas are said to have been "lavender" on Ton 1113, "mauve" on Anderson & Anderson 4658, "purple" on Díaz Luna 11 and J. Rzedowski 7971, and "brilliant crimson-lavender" on Beaman 2704. Lewis & Oliver (1961) report the chromosome number as $2n = 30$.

Solbrig and his associates (1968, 1969, 1970) have crossed this species with material which they have identified as V. peruviana (L.) Britton, V. stellarioides Cham., and V. pulchella Sweet, for all of which, as well as for the hybrids, they employ the generic name Glandularia, although in some cases I cannot find that the combinations have ever been proposed validly in accord with the present very complicated International Rules of Botanical Nomenclature. "Analysis of the behavior of chromosomes at meiosis in the hybrid indicated that the chromosomes of G. pulchella are similar to one of the genomes of G. elegans. Non-homologous pairing and presence of multivalents also indicated that G. elegans is a segmented allohexaploid derived most likely from So. Amer. ancestors." They found pure V. elegans seeds to show 99 percent fertility, but the hybrid from less than 5 to over 70 percent.

Material of V. elegans has been misidentified and distributed in some herbaria under the names V. elegans var. asperata Perry and V. prostrata R. Br. On the other hand, the Detling 9642 and J. Rzedowski 21919, distributed as V. elegans, are actually V. bipinnatifida Nutt., while Johnston & Davis s.n. [7 April 1946] and H. M. Parker 501 are V. delticola Small and S. Sanderson 262 is V. elegans var. asperata Perry.

Additional citations: MEXICO: Chiapas: Ton 1114 (N, W-- 2556725), 1489 (N). Federal District: Huerta s.n. [8/VIII/1962] (Ip). Hidalgo: Anduaga A. 3 (N); M. R. Díaz 27 (Ac); González Quintero 1933 (Ac), 2167 (Ip, Rf), 2710 (Ip), 2868, in part (Mi); Hidalgo & Anda s.n. [25/VI/1967] (Mi, Mi, Mi); L. I. Davis s.n.

[7 July 1944] (Au--278267); Mears 265a (Au--255309), 307a (Au--256227); Medellín s.n. [7/VIII/1954] (Ip); J. Rzedowski 17002 (Au--243525); Vela G. 1397 (Ip). Michoacán: Díaz Luna 11 (Ip). Nuevo León: Beaman 2704 (Au--240747, W--2575374); Johnston & Davis s.n. [21 April 1946] (Au--278283). San Luis Potosí: Anderson & Anderson 4658 (Mi); Johnston & Davis s.n. [16 June 1947] (Au--278273, Au--278274); J. Rzedowski 4344 (Au--169899), 7271 (Ip). Tamaulipas: M. B. Webster 138 (Au--241511).

VERBENA ELEGANS H.B.K. x **V. PERUVIANA** (L.) Britton ex Moldenke, Fifth Summ. 1: 370 (1971) and 2: 914. 1971.

Synonymy: Glandularia elegans x peruviana Solbrig in Solbrig, Passani, & Glass, Am. Journ. Bot. 55: 1236--1238. 1968.

Bibliography: Solbrig, Passani, & Glass, Am. Journ. Bot. 55: 1236--1238. 1968; Solbrig, Passani, & Glass, Biol. Abstr. 50: 4151. 1969; Solbrig, Princ. & Meth. Pl. Biosystem. 148. 1970; Moldenke, Fifth Summ. 1: 370 (1971) and 2: 914 & 970. 1971.

Solbrig and his associates (1968, 1969, 1970) speak of the artificial crosses which they have made between these two species, producing a tetraploid hybrid which showed less than 5 percent fertility and a segmental allooctoploid hybrid which showed over 70 percent fertility. A binomial designation has not yet been proposed for these hybrids.

VERBENA ELEGANS H.B.K. x **V. PULCHELLA** Sweet ex Moldenke, Fifth Summ. 1: 370 (1971) and 2: 914 & 970. 1971.

Synonymy: Glandularia elegans x pulchella Solbrig in Solbrig, Passani, & Glass, Am. Journ. Bot. 55: 1236--1238. 1968. Verbena pulchella Sweet x V. elegans H.B.K. ex Moldenke, Fifth Summ. 1: 370 (1971) and 2: 919 & 970. 1971.

Bibliography: Solbrig, Passani, & Glass, Am. Journ. Bot. 55: 1236--1238. 1968; Solbrig, Passani, & Glass, Biol. Abstr. 50: 4151. 1969; Solbrig, Princ. & Meth. Pl. Biosystem. 148. 1970; Moldenke, Fifth Summ. 1: 370 (1971) and 2: 914 & 970. 1971.

Solbrig and his associates (1968, 1969, 1970) speak of the crosses which they have made between these two species, producing a tetraploid hybrid showing less than 10 percent fertility. I am not certain whether their concept of V. pulchella is the same as mine or is that of some modern Argentine botanists, so it seems best not to propose a binomial name for their hybrid until the exact parentage is verified by examination of herbarium vouchers.

VERBENA ELEGANS H.B.K. x **V. STELLARIOIDES** Cham. ex Moldenke, Fifth Summ. 1: 370 (1971) and 2: 914 & 970. 1971.

Synonymy: Glandularia elegans x stellaroides Solbrig in Solbrig, Passani, & Glass, Am. Journ. Bot. 55: 1236 & 1237. 1968.

Bibliography: Solbrig, Passani, & Glass, Am. Journ. Bot. 55: 1236 & 1237. 1968; Moldenke, Fifth Summ. 1: 370 (1971) and 2: 914 & 970. 1971.

Solbrig and his associates (1968) speak of the hybrid which they have produced between these two species, but it seems best not to propose a binomial designation for this hybrid until the parentage can be verified by examination of herbarium vouchers. It is possible that one of the parents may have been V. sessilis (Cham.) Kuntze instead of V. stellarioides Cham., since the differences between these two species are not always obvious.

VERBENA ELEGANS var. ASPERATA Perry

Additional synonymy: Verbena elegans var. asperate Perry ex Moldenke, Résumé Suppl. 18: 14, in syn. 1969.

Additional & emended bibliography: Lewis & Oliv., Am. Journ. Bot. 48: [639] & 641, fig. 11. 1961; Turrill in Curtis, Bot. Mag. 174: pl. 409. 1963; Hocking, Excerpt. Bot. A. 6: 91. 1963; Moldenke, Phytologia 15: 492 & 493 (1968) and 16: 62. 1968; Syngé, Suppl. Dict. Gard., ed. 2, 548. 1969; Moldenke in Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. Bot. 6:] 1316, 1317, & 1323. 1970; Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. Bot. 6:] 1876 & 1877. 1970; Moldenke, Fifth Summ. 1: 58, 75, 204, 205, & 370 (1971) and 2: 667 & 914. 1971; Moldenke, Phytologia 22: 461. 1972.

Additional & emended illustrations: Lewis & Oliv., Am. Journ. Bot. 48: 651, fig. 11. 1961; Turrill in Curtis, Bot. Mag. 174: pl. 409 [as V. wrightii] (in color). 1963.

Recent collectors have encountered this variety along roadsides, by streams, and in both Quercus and Abies woods. Breedlove found it on slopes with Arbutus, Pinus, and Quercus, while with Kawahara he encountered it on wooded banks of streams with Alnus sp., Padus serotina, Pinus engelmanni, and Quercus spp. Rzedowski reports it from "ladera margosa con vegetación de matorral secundario abierto", "ladera caliza con vegetación de zacatal", "ladera caliza con vegetación de encinar", "ladera riolitica con vegetación de bosque de pino-encino", and "matorral de Cordia boissieri". It has been collected at altitudes of 710 to 3000 meters, and, in addition to the months previously reported by me, in flower and fruit in November.

The corollas are described as "lavender" on Breedlove 15558, "deep-rose" on Breedlove & Kawahara 16890, and "purple" on Breedlove 14418 and J. Rzedowski 24493 & 24842. Lot describes the plant as herbaceous, to 40 cm. tall, and notes "flor lila".

The color plate presented by Turrill (1963) as illustrative of V. wrightii A. Gray is very obviously V. elegans var. asperata instead.

Material of V. elegans var. asperata has been misidentified and distributed in some herbaria under the name V. prostrata R. Br. On the other hand, the Mendiola s.n. [Saltiño Torreón], distributed as V. elegans var. asperata, is really V. ambrosifolia Rydb., while J. Rzedowski 7971 is typical V. elegans H.B.K.

Additional & emended citations: MEXICO: Chiapas: Breedlove

14418 (N, Ws). Hidalgo: Chávez O. s.n. [4.VIII.63] (Ip); González Quintero 2868, in part (Ip), 3252 (Rf), 3288 (Ac), s.n. [21.VI.1964] (Ip). San Luis Potosí: J. Rzedowski 6389 (Ip), 10243 (Ip), 24493 (Ip), 24676 (Ac), 24842 (Ac), 24865 (Ip); S. Sander-son 262 (Au--297634). Sinaloa: Breedlove 15558 (Rf); Breedlove & Kawahara 16890 (Rf). Sonora: Tucker 3478 (Se--6079); R. M. Turner 59-50 (Sd--65667). Tamaulipas: Stanford, Lauber, & Taylor 2486 (Se--149113); M. B. Webster 155 (Au--241557). Veracruz: Lot 429 (G). GERMANY: Gizantoro s.n. [9.66] (Lu).

xVERBENA ENGELMANNII Moldenke

Additional & emended synonymy: Verbena hastata γ oblongifolia Nutt. ex A. Wood, Class-book, ed. 2, pr. 1, 412. 1847. Verbena hastato-urticifolia Bebb, in herb.

Additional & emended bibliography: A. Wood, Class-book, ed. 2, pr. 1, 412 (1847), ed. 2, pr. 2, 412 (1848), ed. 10, pr. 1, 412 (1848), ed. 10, pr. 2, 412 (1849), ed. 10, pr. 3, 412 (1850), ed. 17, 412 (1851), ed. 23, 412 (1851), ed. 29, 412 (1853), ed. 35, 412 (1854), ed. 41, pr. 1, 412 (1855), and ed. 41, pr. 2, 412. 1856; Poindexter, Trans. Kans. Acad. Sci. 65: 409, 410, 416, & 417. 1962; Radford, Ahles, & Bell, Guide Vasc. Fl. Carol. 282. 1964; Moldenke, Phytologia 16: 52 & 90. 1968; Moldenke, Résumé Suppl. 16: [1]. 1968; F. C. Seymour, Fl. New Engl. 456. 1969; Domville & Dunbar, John Burroughs Nat. Hist. Soc. Bull. 8: 94. 1970; Moldenke, Fifth Summ. 1: 15--23, 34, 36--40, 43, 45, 53, & 370 (1971) and 2: 649, 667, 673--675, 688, 697, 704, 705, 783, & 914. 1971.

Wood's (1847) description of Nuttall's V. hastata γ oblongifolia is "Lvs. lance-ovate or lance-oblong, sharply serrate; spikes filiform, loosely paniculate; fls. smaller. -- Penn. to Ia. and Mo. I have frequently observed this tall (4--6 f.) variety, and many others, on the sandy plains of Indiana. They appear to be hybrids between V. hastata and V. urticaefolia!" He regards V. paniculata Lam. as a synonym, but most workers regard Lamarck's name as applying to the non-hastate leaved form of V. hastata L.

Morley found the hybrid "scattered in creek bottoms" in Kansas, while Wharton found it "associated with V. hastata in waste ground" in Kentucky. Domville & Dunbar (1970) report it "rare" in Ulster County, New York, where it blooms in the "summer" and is simply called "vervain". Radford, Ahles, & Bell (1964) describe it as a "rare hybrid" between V. scabra Vahl and V. urticifolia L., but in this they are in error, since it is actually a hybrid between V. hastata L. and V. urticifolia L. and occurs commonly in areas not inhabited by V. scabra. They record it from Ashe County, North Carolina. Seymour (1969) found it at Leicester (Addison County) and Pownal (Bennington County), Vermont. The corollas on Wharton 5633a are described as having been "blue".

The H. R. Bennett 2707, distributed as this hybrid, seems to be typical V. hastata L. Three color photographs of this hybrid in situ (A. R. Moldenke 1261 & 1278) are preserved in my personal herbarium.

Additional citations: NEW JERSEY: Somerset Co.: Moldenke & Moldenke 25635 (Ps--674). ILLINOIS: Cass Co.: Geyer s.n. [Beardstown, July 1842] (Ws--isotype). Tazewell Co.: V. H. Chase 3230 (Se--204860). Winnebago Co.: M. S. Bebb s.n. [Fountaindale, 1871] (Pa). KENTUCKY: Madison Co.: Wharton 5633a (Mi). KANSAS: Republic Co.: Morley 820 (N). MISSOURI: St. Louis: Engelmann s.n. [St. Louis, Aug. 1842] (Ws), s.n. [Prairies, 12 August 1877] (Pa).

xVERBENA ENGELMANNII f. ALBIFLORA Moldenke

Bibliography: Moldenke, Résumé Suppl. 3: 2. 1962; Moldenke, Phytologia 9: 97. 1963; Moldenke, Fifth Summ. 1: 18 (1971) and 2: 914. 1971.

VERBENA EPHEDROIDES Cham.

Additional bibliography: Angely, Fl. Anal. Paran., ed. 1, 571. 1965; Moldenke, Phytologia 16: 52. 1968; Moldenke, Fifth Summ. 1: 177, 189, & 200 (1971) and 2: 678, 705, 706, & 914. 1971.

xVERBENA FABRICATA Moldenke

Additional bibliography: Moldenke, Phytologia 11: 457. 1965; Moldenke, Fifth Summ. 1: 370 (1971) and 2: 674, 705, & 914. 1971.

VERBENA FASCICULATA Benth.

Additional bibliography: J. F. Macbr., Field Mus. Publ. Bot. 13 (5): 613, 614, 620, 625, & 629. 1960; Moldenke, Phytologia 14: 281 & 282. 1967; Moldenke, Fifth Summ. 1: 143 (1971) and 2: 682, 686, & 914. 1971.

According to Macbride (1960), the type of V. fasciculata was collected by Richard Brinsley Hinds at "Huamantango", which he says is "probably Huamantamba near Canta, Lima, which is in the scope of Cuming's brief visit". He cites only Cuming 954 "fide Benth" from "On the coast" of Peru. He attempts to keep V. fasciculata Benth. and V. matthewsii Briq. apart as separate species, keying them as follows:

Leaves "3-divided nearly to the base, rarely in part entire or bifurcate" V. fasciculata
 Leaves "more or less trifid but obviously cuneate-based or petiolately narrowed, the segments variously serrate and pinnate or dissected, rather entire" V. matthewsii

As reported by me previously, Edgar Milne-Redhead has compared the types of both species at Kew and reports that they cannot be distinguished from each other.

In his discussion of what he calls V. matthewsii Macbride says "Neighbor of V. Berterii (Meisn.) Schauer and V. clavata R. & P. with procumbent branches, the former too with shorter bracts, the

latter with 3-divided leaves, the segments pseudoverticillate (author). — Type was distributed as V. laciniata (L.) Briq. and doubtfully a distinct species but as here listed leaf-segments broader, in type seen acute but Lima and Huánuco specimens with more obtuse segments could be placed here. Species name here spelled with two t's, as it was sometimes spelled by the collector. F. M. Neg. 24691." He cites the following Peruvian specimens: Ancash: Macbride 2539. Ayacucho: Ferreyra 5470. Cajamarca: Stork & Horton 10032. Junín: Soukup 3537. Lima: Mathews 498, Stork & Vargas 9341.

Verbena fasciculata has been collected at altitudes of 400 to 3900 meters. Recent collectors have found it flowering in October and November and fruiting in October.

Additional citations: PERU: Ancash: Vargas Calderón 10276 (Ac). Arequipa: Vargas Calderón 18246 (Ac).

xVERBENA FECUNDA Moldenke

Additional bibliography: Hocking, Excerpt. Bot. A.1: 430. 1959; Moldenke, Phytologia 14: 282. 1967; Moldenke, Fifth Summ. 1: 370 (1971) and 2: 658, 782, & 914. 1971.

xVERBENA FERAX Moldenke

Additional bibliography: Hocking, Excerpt. Bot. A.1: 430. 1959; Moldenke, Phytologia 14: 283. 1967; Moldenke, Fifth Summ. 1: 370 (1971) and 2: 658, 692, & 914. 1971.

VERBENA FERREYRAE Moldenke

Additional bibliography: J. F. Macbr., Field Mus. Publ. Bot. 13 (5): 613, 620—621, & 624. 1960; Moldenke, Phytologia 11: 457—458. 1965; Moldenke, Fifth Summ. 1: 143 (1971) and 2: 914. 1971.

VERBENA FILICAULIS Schau.

Additional bibliography: Angely, Fl. Anal. Paran., ed. 1, 571. 1965; Moldenke, Phytologia 16: 52—53. 1968; Moldenke, Fifth Summ. 1: 177 & 200 (1971) and 2: 690 & 914. 1971.

Hatschbach describes this plant as decumbent, growing in acid turf-covered soil. It has been collected in anthesis in April and October, in addition to the months previously reported. The corollas are described as having been "violet" on Hatschbach 14192 & 20082.

Additional citations: BRAZIL: Paraná: Hatschbach 14192 (W—2564173), 20082 (N), 22719 (N). Santa Catarina: Smith & Klein 13390 (N).

VERBENA FLAVA Gill. & Hook. in Hook., Bot. Misc. 1: 170. 1829.

Additional synonymy: Verbena flava var. flava Troncoso in Böcher, Hjerting, & Rahn, Dansk Bot. Arkiv 22 (1): 109. 1963.

Additional & emended bibliography: Reiche & Phil., Fl. Chil. 5: 295 & 463. 1910; Hauman, Anal. Soc. Cien. Argent. 86: 150. 1918; J. A. Clark, Card Ind. Gen. Sp. Var. issue 183. 1944;

Troncoso in Böcher, Hjerting, & Rahn, Dansk Bot. Arkiv 22 (1): 109. 1963; Moldenke, Phytologia 16: 53. 1968; Moldenke, Résumé Suppl. 16: 6. 1968; Bolkh., Grif, Matvej., & Zakhar., Chrom. Numb. Flow. Pl. 715 & 717. 1969; Schnack & Rubens, Bol. Soc. Argent. Bot. 13: 206. 1970; Moldenke, Fifth Summ. 1: 200 (1971) and 2: 521, 668, & 914. 1971.

Böcher, Hjerting, & Rahn (1963) collected this plant at 2150 meters altitude (no. 2138).

Additional citations: ARGENTINA: Neuquen: E. Ammann 113 (N).

VERBENA FLAVA var. ANGUSTILOBA Speg.

Additional bibliography: Moldenke, Phytologia 9: 122--123. 1963; Moldenke, Fifth Summ. 1: 200 (1971) and 2: 668 & 914. 1971.

VERBENA FLAVA var. LATILOBA Speg.

Additional bibliography: Hauman, Anal. Soc. Cienc. Argent. 86: 150. 1918; Troncoso in Böcher, Hjerting, & Rahn, Dansk Bot. Arkiv 22 (1): 109. 1963; Moldenke, Phytologia 9: 123. 1963; Moldenke, Fifth Summ. 1: 200 (1971) and 2: 668 & 914. 1971.

Troncoso (1963) states that this variety was collected by Hicken at 2000 meters altitude in the Diamante area.

VERBENA FLAVA var. LATILOBA f. ABORTIVA Hicken

Additional bibliography: Moldenke, Phytologia 9: 123. 1963; Moldenke, Fifth Summ. 1: 200 (1971) and 2: 914. 1971.

VERBENA GALAPAGOSSENSIS Moldenke

Additional bibliography: Moldenke, Phytologia 11: 458 (1965) and 16: 342. 1968; Wiggins & Porter, Fl. Galáp. Isls. 997. 1971; Moldenke in Wiggins & Porter, Fl. Galáp. Isls. 503--505 & 509. 1971; Moldenke, Fifth Summ. 1: 138 (1971) and 2: 914. 1971.

VERBENA GENTRYI Moldenke

Additional bibliography: Moldenke, Phytologia 11: 458. 1965; Moldenke, Fifth Summ. 1: 75 (1971) and 2: 914. 1971.

Breedlove & Thorne found this plant growing on dry slopes with Bursera, Ipomoea, Lysiloma, and Quercus, at 3800 feet altitude, flowering in September. The corollas are described as having been white on Breedlove & Thorne 18073.

Additional citations: MEXICO: Sinaloa: Breedlove & Thorne 18073 (Z).

VERBENA GLABRATA H.B.K.

Emended synonymy: Verbena glabrata Humb. & Bonpl. ex Steud., Nom. Bot. Phan., ed. 1, 873. 1821.

Additional & emended bibliography: Steud., Nom. Bot. Phan., ed. 1, 873. 1821; J. F. Macbr., Field Mus. Publ. Bot. 13 (5): 615 & 621. 1960; Hocking, Excerpt. Bot. A.7: 456. 1964; Moldenke, Biol. Abstr. 49: 1325 (1968) and 49 (3): B.A.S.I.C. S.185. 1968; Moldenke, Phytologia 16: 53, 98, 211, & 341. 1968; Moldenke, Résumé Suppl. 16: 5. 1968; Hocking, Excerpt. Bot. A.14: 206. 1969; Molden-

ke, Biol. Abstr. 50: 418. 1969; Wiggins & Porter, Fl. Galáp. Isls. 26 & 997. 1971; Moldenke in Wiggins & Porter, Fl. Galáp. Isls. 503--505 & 609. 1971; Moldenke, Fifth Summ. 1: 120, 137, & 143 (1971) and 2: 671 & 914. 1971.

Macbride (1960) credits this binomial to "HBK. Nov. Gen. & Sp. 2: 276. 1818", but it actually dates back to "ed. folio, 2: 223--224. 1817". He says of the plant "To 1 meter tall, corolla tube red, blue-violet above, fruit red-maroon (Metcalf). Schauer says this is more compact, more glabrate than V. litoralis HBK. var. pyncostachys Schauer; compare V. bonariensis L., V. brasiliensis Vell." He cites only Metcalf 30294 from Ayacucho, but records the species also from Cuzco and Lima, Peru, and gives its extralimital distribution as "Venezuela; Ecuador." I have never seen any material of it from Venezuela and cannot believe that it is found there.

Recent collectors have encountered this plant growing among lakeshore vegetation, on old airfields, and in secondary cloud-forests. Holm-Nielsen & Jeppesen found it in "both humid and more dry places near road in meadows". The corollas on Asplund 17227 are described as having been "pale-lilac", while those on Asplund 19923 were "pale bluish-violet".

The Rose, Pachano, & Rose 22851, previously cited by me as V. glabrata, is actually V. demissa Moldenke, while Rose, Pachano, & Rose 22939 is V. parvula Hayek.

Additional citations: ECUADOR: Cotopaxi: Holm-Nielsen & Jeppesen 1147 (Ac). Imbabura: Asplund 20189 (N). Loja: Sparre 16664 (S). Napo: Sparre 17690 (S). Pastaza: Sparre 17525 (S). Pichincha: Asplund 16030 (N), 16139 (N), 17227 (N), 20151 (N); Sparre 16899 (S). Tungurahua: Asplund 19923 (N). PERU: La Libertad: Sagástegui A. 7192 (N).

VERBENA GLABRATA var. TENUISPICATA Moldenke

Additional bibliography: Moldenke, Phytologia 16: 53, 211, & 341. 1968; Moldenke, Résumé Suppl. 16: 5. 1968; Moldenke, Biol. Abstr. 49: 1325 (1968), 49 (3): B.A.S.I.C. S. 185 (1968), and 50: 418. 1969; Hocking, Excerpt. Bot. A. 14: 206. 1969; Wiggins & Porter, Fl. Galáp. Isls. 26 & 997. 1971; Moldenke in Wiggins & Porter, Fl. Galáp. Isls. 503--505 & 509. 1971; Moldenke, Fifth Summ. 1: 138 (1971) and 2: 914. 1971.

Additional citations: GALAPAGOS ISLANDS: James: C. Darwin s.n. (Cu).

VERBENA GLANDULIFERA Moldenke

Additional bibliography: Moldenke, Phytologia 13: 196. 1966; Moldenke, Fifth Summ. 1: 200 (1971) and 2: 521 & 914. 1971.

In addition to months previously reported by me, this plant has also been found in fruit in January. The corollas on Varela 699 are described as having been "sky-blue".

Additional citations: ARGENTINA: Catamarca: Luna Risso 505 (N).

San Luis: Varela 699 (N). Santiago del Estero: Pierotti "h" [31/III/44] (N), "h" [3/IV/44] (N).

VERBENA GLUTINOSA Kuntze

Additional bibliography: Briq. in Chod. & Wilczek, Bull. Herb. Boiss., sér. 2, 2: 544. 1902; Troncoso in Böcher, Hjerting, & Rahn, Dansk Bot. Arkiv 22 (1): 109. 1963; Moldenke, Phytologia 14: 283 & 287. 1967; Schnack & Rubens, Bol. Soc. Argent. Bot. 13: 207. 1970; Moldenke, Fifth Summ. 1: 184 & 200 (1971) and 2: 521, 668, & 914. 1971.

Briquet (1902) cites Wilczek 54. Schnack & Rubens (1970) report the species from La Pampa and Neuquén, Argentina, while Troncoso (1963) cites Böcher, Hjerting, & Rahn 676 & 768, but notes that the material of the former number is "not typical". These collectors found the plant growing in riverbeds and describe the flowers as "yellow or flesh-coloured".

Additional citations: ARGENTINA: Mendoza: H. H. Bartlett 19521 (N).

xVERBENA GONZALEZI Moldenke

Additional bibliography: Moldenke, Phytologia 13: 196. 1966; Moldenke, Fifth Summ. 1: 370 (1971) and 2: 522, 689, 694, & 914. 1971.

VERBENA GOODDINGII Briq.

Additional & emended synonymy: Glandularia gooddingii (Briq.) Solbrig ex Rattenbury, Madroño 15: 50. 1959. Verbena bracteata gooddingii Ferris in Abrams & Ferris, Illustr. Fl. Pacific States, pr. 1, 4: 730, in syn. 1960.

Additional & emended bibliography: Rydb., Fl. Rocky Mtns., ed. 1, 739 & 740 (1917) and ed. 2, pr. 1, 739 & 740. 1922; Tidestr., Contrib. U. S. Nat. Herb. 25 [Fl. Utah & Nev.], pr. 1, 469. 1925; E. C. Jaeger, Desert Wild Fls., ed. 1, 219 & 220, fig. 508 (1940) and ed. [2], pr. 1, 219 & 220, fig. 508. 1941; Abrams, Illustr. Fl. Pacif. States, pr. 1, 3: 610, 612, & 616, fig. 4347. 1951; Rydb., Fl. Rocky Mtns., ed. 2, pr. 2, 739 & 740. 1954; J. A. Clark, Card Ind. Gen. Sp. Var. issue 231. 1959; Rattenbury, Madroño 15: 50. 1959; Ferris in Abrams & Ferris, Illustr. Fl. Pacific States, pr. 1, 4: 651 & 730. 1960; Howell & McClintock in Kearney & Peebles, Ariz. Pl., ed. 2, 725—727. 1960; Lewis & Oliv., Am. Journ. Bot. 48: [639]. 1961; Munz, Calif. Desert Wildfls., ed. 1, 47 & 122, pl. 62. 1962; Hocking, Excerpt. Bot. A.6: 91 (1963) and A.7: 456. 1964; Ferris in Abrams & Ferris, Illustr. Fl. Pacific States, pr. 2, 4: 651 & 730. 1965; G. Taylor, Ind. Kew. Suppl. 13: 61. 1966; Abrams, Illustr. Fl. Pacific States, pr. 2, 3: 610, 612, & 616, fig. 4347. 1967; L. C. Higgins, Fl. Beaver Dam Mtns. 223. 1967; E. C. Jaeger, Desert Wild Fls., ed. 2, pr. 9, xxvii, 219, & 220, fig. 508. 1968; Moldenke, Phytologia 16: 187, 202, & 215. 1968; Munz & Keck, Calif. Fl. 687, 688, & 1679, fig. 65. 1968; Munz, Suppl. Calif. Fl. 101. 1968; Bolkh., Grif, Matvej., & Zakhar., Chrom. Numb. Flow. Pl. 715 & 717. 1969; Munz, Calif.

Desert Wildfls., ed. 2, 47 & 122, pl. 62. 1969; Rickett, Wild Fls. U. S. 3 (2): 362 & [363], pl. 110. 1969; Rydb., Fl. Rocky Mtns., ed. 2, pr. 3, 739 & 740. 1969; Tidestr., Contrib. U. S. Nat. Herb. 25 [Fl. Utah & Nev.], pr. 2, 469. 1969; Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. Bot. 6:] 1876 & 1877. 1970; Moldenke in Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. Bot. 6:] 1317 & 1325—1326. 1970; Rickett, Wild Fls. U. S. 4 (3): 539, [541], & 799, pl. 176. 1970; Moldenke, Fifth Summ. 1: 32, 50, 51, 53, 58, 62, 63, 65, 75, & 370 (1971) and 2: 521, 654, 656, 671, 706, 708, & 915. 1971; Moldenke, Phytologia 22: 485 & 497 (1972) and 23: 188. 1972.

Additional & emended illustrations: E. C. Jaeger, Desert Wild Fls., ed. 1, 220, fig. 508 (1940) and ed. [2], pr. 1, 220, fig. 508. 1941; Munz, Calif. Desert Wildfls., ed. 1, 47, pl. 62 (in color). 1962; Munz & Keck, Calif. Fl. 687, fig. 65. 1968; E. C. Jaeger, Desert Wild Fls., ed. 2, pr. 9, 220, fig. 508. 1968; Munz, Calif. Desert Wildfls., ed. 2, 47, pl. 62 (in color). 1969; Rickett, Wild Fls. U. S. 3 (2): [363], pl. 110 (in color) (1969) and 4 (3): [541], pl. 176 (in color). 1970.

The Madroño (1959) reference in the bibliography above is sometimes credited to Solbrig, while Bolkhovskikh and his associates (1969) cite it as "Darlington, Document. Chrom. Numb. Pl....", but it seems actually to be a continuation of a series started by Rattenbury and not otherwise accredited.

Recent collectors describe this plant as having dark-green foliage and have found it growing in dry mesquite deserts and roadsides. Moran reports it as "rather scarce" at 1650 meters altitude in Baja California, while Gentry & Fox found it "scattered along moister bottomland of open canyon bottoms" in the same state. The Mearses describe it as "common with Astragalus, Cenchrus, and Gaillardia" in Santa Cruz County, Arizona, "common with Cowania, Eriodictyon, Mirabilis, and Penstemon" in Clark County, Nevada, and as growing with Juniperus and Yucca baccata in San Bernardino County, California. Higgins (1967) confirms its presence in Washington County, Utah. Jaeger (1968) informs us that it is known in California from dry limestone canyons and slopes of the Clark and Providence Mountains and from there eastward to Texas. Howell & McClintock (1960) aver that it is found "throughout the state [of Arizona] mostly below 5,000 feet, dry slopes & mesas, flowering throughout the year; commonest and most widespread species in Arizona". They cite Jones 3901, from Yucca, Mohave County, as the type collection of V. arizonica Briq., which is correct, but it represents var. nepetifolia Tidestr. rather than the typical form of the species. They cite also N. C. Wilson 95, from Diamond Creek, Mohave County, as the type collection of V. verna A. Nels.; this is also now regarded as var. nepetifolia.

The following vernacular names are recorded for V. gooddingii in addition to those previously reported by me: "desert vervain" and "Goodding verbenas".

Lewis & Oliver (1961) give 30 as the diploid chromosome number

for this species, while Solbrig is said by Rattenbury (1959) to have found it to be 20. It should be noted, however, that the Lewis & Oliver record was for var. nepetifolia rather than the typical form of the species.

The corollas on Gentry & Fox 11789 are described as having been "pink", those on Beatley 9969 were "deep blue-lavender", and those on R. V. Moran 10993 were "pale-lavender". Rickett (1969) describes the species as "densely hairy. The leaves are cleft into three lobes which are coarsely toothed or jaggedly cleft. The corolla may be pink, lavender, or blue, the lobes spreading 1/3 - 1/2 inch across", says that it blossoms from "February to October" and is found "in sandy soil and mountains from southwestern Texas to California and Nevada; and in Baja California".

Material of this species has been misidentified and distributed in some herbaria as V. neomexicana (A. Gray) Small. On the other hand, the O. M. Clark 11128, distributed as V. gooddingii, is actually var. nepetifolia Tidestr., Wiggins & Thomas 187 is V. lilacina Greene, and H. V. Moran 11176 is V. plicata Greene.

Additional citations: NEVADA: Clark Co.: Mears & Mears 1895 (Au--258463). Nye Co.: Beatley 9969 (N). TEXAS: Brewster Co.: Nelson & Nelson 5025 (Se--118764). ARIZONA: Coconino Co.: Coffey 25 (Ac); DeLuna 19 (Rf). Mohave Co.: N. D. Atwood 1730 (N, W--2599146); X. M. Gaines 1361 (Se--228422); C. L. Hitchcock 25611 (N, Se--235128, W--2580550); Munz 11691 (Se--126728). Pima Co.: C. L. Hitchcock 25540 (N, Se--236480, W--2580529). Pinal Co.: A. Davis 32 (Fg). Santa Cruz Co.: Keil, Pinkava, & Lehto 9334 (N); Mears & Mears 1691 (Au--257979). Yavapai Co.: Blalock 21 (Rf); Demaree 43883 (Rf); Greenwell 63 (Ac); C. F. Harbison 41178 (Sd--28992); D. F. Howe s.n. [24 April 1966] (Sd--64277). CALIFORNIA: San Bernardino Co.: M. Beal 5114 (Se--161257); Letcher s.n. [San Bernardino, March 31, 1929] (Sd--41006); Moldenke & Moldenke 3206 (Ac); Munz 12860 (Se--162774); Munz, Johnson, & Harwood 4254 (Se--162773); C. B. Wolf 7021 (Se--137467), 9680 (Sd--42496, Se--122997), 10718 (Au--122112). MEXICO: Baja California: Gentry & Fox 11789 (Mi); R. V. Moran 10993 (Sd--53867), 13532 (Sd--63646); I. L. Wiggins 15074 (Se--208881); Wiggins & Wiggins 16073 (Au--238501). CULTIVATED: California: Balls 18900 (Se--157360).

VERBENA GOODDINGII var. NEPETIFOLIA Tidestr.

Additional synonymy: Verbena gooddingii nepetifolia Tidestr., in herb.

Additional & emended bibliography: Tidestr., Contrib. U. S. Nat. Herb. 25 [Fl. Utah & Nev.], pr. 1, 469. 1925; Lewis & Oliv., Am. Journ. Bot. 48: [639]. 1961; Hocking, Excerpt. Bot. A.6: 91. 1963; Moldenke, Phytologia 16: 187. 1968; Munz, Suppl. Calif. Fl. 101. 1968; Tidestr., Contrib. U. S. Nat. Herb. 25 [Fl. Utah & Nev.], pr. 2, 469. 1969; Moldenke, Fifth Summ. 1: 50, 51, 63, 65, & 75 (1971) and 2: 652, 654, 663, 671, 706, 773,

& 915. 1971; Moldenke, Phytologia 22: 485 & 497 (1972) and 23: 188. 1972.

Recent collectors have found this variety growing in arroyos, among dry rocks, and among eroded granite boulders. Moran found it to be "occasional along arroyos" in Baja California, while Moran, Witham, & Hommersand report it "locally common in disturbed areas" and Henrickson says it was found "in edge of deeply cut erosion areas in clay soil" in the same state. Mears calls it "common in canyons with Agrostis, Erythrina, and Rhus" in Arizona. The corollas are said to have been "rose" on R. V. Moran 7893 and "rose-purple" on Henrickson 2311.

Material has been misidentified and distributed in some herbaria under the names V. bracteata Lag. & Rodr. and "V. cillata Benth." On the other hand, the Diaz L. s.n. [16.IX.1959], distributed as this variety, is actually V. delticola Small, while Jarabek s.n. [June 1945] is not even verbenaceous.

Additional citations: ARIZONA: Mohave Co.: Pinkava, Lewis, Noble, & Lehto 11249 (N). Pima Co.: L. M. Andrews 259a (N); J. A. Mears 1744 (Au--258005). Yavapai Co.: Toumey 305 (Sd--52238). County undetermined: O. M. Clark 11428 [S. Bateswell, Grawley Mtns.] (Au--122113). MEXICO: Baja California: Bell & Newcomb 1356 (Se--148592); Bratstrom s.n. [March 17, 1951] (Sd); C. F. Harbison 27283 (Sd--27283), 41549 (Sd--41549), s.n. [April 2, 1950] (Sd--43850); Hastings & Turner 63-192 (Sd--56502); Henrickson 2311 (Mi); Huey s.n. [June 16, 1947] (Sd--41944); R. V. Moran 7893 (Sd--60711), 10226 (Sd--54554); Moran, Witham, & Hommersand 16541 (Mi). Sonora: I. L. Wiggins 7225 (Se--168335), 11775 (Sd--47325).

xVERBENA GOODMANI Moldenke

Synonymy: Verbena halei Small x V. stricta Vent. ex Moldenke, Fifth Summ. 2: 672, in syn. 1971. Verbena stricta Vent. x V. halei Small ex Moldenke, Fifth Summ. 2: 698, in syn. 1971. Verbena goodmanii Moldenke, in herb.

Additional bibliography: Moldenke, Phytologia 14: 283. 1967; Moldenke, Fifth Summ. 1: 53 (1971) and 2: 672, 698, & 915. 1971.

Additional citations: OKLAHOMA: Marshall Co.: Goodman 7233 (Se--212514).

VERBENA GOYAZENSIS Moldenke

Additional bibliography: Moldenke, Phytologia 9: 147--148. 1963; Moldenke, Fifth Summ. 1: 177 (1971) and 2: 915. 1971.

VERBENA GRACILESCENS (Cham.) Herter

Additional & emended bibliography: Cabrera, Man. Fl. Alred. Buenos Aires 394 & 395. 1953; Troncoso in Cabrera, Fl. Prov. Buenos Aires 5: 128 & 131. 1965; Meyer & Weyrauch, Inst. Mig. Lill. Misc. 23: [Guia Excurs. Biol. Tucum.] 64 & 123. 1966; Mar-

tínez-Crovetto, Bonplandia 2: 131. 1967; Moldenke, Phytologia 16: 55 & 102. 1968; Bolkh., Grif, Matvej., & Zakhar., Chrom. Numb. Flow. Pl. 717. 1969; Moldenke, Fifth Summ. 1: 177, 184, 187, 189, & 200 (1971) and 2: 651, 671, 672, 687, & 915. 1971.

The corollas of this species are described as having been "rose" on A. T. Hunziker 6318, "lilac" on Burkart 13841 and Luna 370 & 451, and "blue" on Ibarrola 2169. The plant has been collected in fruit from July to December. Troncoso (1965) gives its distribution as "Sudamérica templada. Común en campos bajos y húmedos" and cites Burkart 3656, Cabrera 5701 & 7223, and Venturi 59 from Buenos Aires, deposited in the San Isidro and La Plata herbaria.

Additional citations: ARGENTINA: Córdoba: Balegno 256 (N); Burkart 13841 (N); A. T. Hunziker 6318 (N). Corrientes: Ibarrola 2169 (N). Formosa: I. Morel 16 (N), 3459 (N), 3648 (N), 3667 (N), 3723 (N), 3778 (N). Jujuy: A. Reales 633 (N), 969 (N). Salta: Luna 451 (N); T. Meyer 8403 (N). Santa Fé: Ruiz Huidobro 3080 (Se--129885). Santiago del Estero: Luna 370 (N), 415 (N). Tucumán: O'Donell 5417 (N). PARAGUAY: T. Rojas 102b (Ws). URUGUAY: Rosengurtt Gurvich & Gallinal 5803 (Se--122506).

VERBENA GRACILIS Desf.

Additional & emended bibliography: Rydb., Fl. Rocky Mtns., ed. 2, pr. 1, 739 & 740. 1922; Tidestr., Contrib. U. S. Nat. Herb. 25 [Fl. Utah & Nev.], pr. 1, 469. 1925; Rydb., Fl. Rocky Mtns., ed. 2, pr. 2, 739 & 740. 1954; Howell & McClintock in Kearney & Peebles, Ariz. Fl., ed. 2, 726 & 728. 1960; Moldenke, Phytologia 16: 55. 1968; Moldenke, Résumé Suppl. 16: 2. 1968; Rydb., Fl. Rocky Mtns., ed. 2, pr. 3, 739 & 740. 1969; Tidestr., Contrib. U. S. Nat. Herb. 25 [Fl. Utah & Nev.], pr. 2, 469. 1969; Rickett, Wild Fls. U. S. 4 (3): 540 & 799. 1970; Moldenke, Fifth Summ. 1: 50, 63, 75, & 370 (1971) and 2: 652, 688, 693, & 915. 1971; Moldenke, Phytologia 22: 485 & 499. 1972.

The type of V. arizonica A. Gray was collected by John Gill Lemmon in Tanner's Cañon, near Fort Huachuca, Cochise County, Arizona, in 1882, and is deposited in the Gray Herbarium at Harvard University. Howell & McClintock (1960) state that the species grows at altitudes of 4500--6500 feet in Arizona and flowers there from June to October. Recent collectors have found it in flower and fruit also in December, growing in abandoned fields and on inundated ground. The Matthews describe it as "very abundant throughout open fields along railroad tracks" in Sonora, Urueta found it in "pastizales" in México, Stuessy calls it "scarce" in Chihuahua, Holguín found it on "ladera basáltica con vegetación de matorral de Opuntia, Zaluzania y Mimosa" in México, and Rzedowski in "charcos cercanos a la carretera" in México and "ladera riolítica con vegetación de zacatal" in San Luis Potosí.

Material has been misidentified and distributed in some herbaria as V. halei Small. The González Quintero 1908 and J. Rze-

dowski 15671 represent a small-bracted densely fruited form of the species. The corollas on Stuessy 1013 are described as having been "blue" and on J. Rzedowski 1352, 1473, 11225, & 11265 as "purple". The P. O. Schallert s.n. [6/16/43], distributed as V. gracilis, is actually V. bracteata Lag. & Rodr.

Additional citations: ARIZONA: Cochise Co.: W. W. Jones s.n. [Aug. 10, 1926] (Sd--47326). MEXICO: Chihuahua: Stuessy 1013 (Ip). Federal District: J. Rzedowski 1352 (Au--241293, Ip--1615), 1473 (Ip--1614). Hidalgo: González Quintero 1908 (Ip). México: Holguin s.n. [4/VII/1965] (Ac); J. Rzedowski 15671 (Ip), 20288 (Rf); Urueta 32 (Rf). San Luis Potosí: J. Rzedowski 3429 (Ip), 7995 (Ip), 11225 (Ip), 11265 (Ip). Sonora: Matthews & Matthews 487 (Au--259934).

VERBENA GRISEA Robinson & Greenn.

Additional bibliography: Moldenke, *Phytologia* 16: 55--56 & 342. 1968; Moldenke in Wiggins & Porter, *Fl. Galáp. Isls.* 503 & 505. 1971; Wiggins & Porter, *Fl. Galáp. Isls.* 997. 1971; Moldenke, *Fifth Summ.* 1: 138 (1971) and 2: 915. 1971.

VERBENA GUARANITICA (Troncoso) Moldenke, *Phytologia* 23: 211. 1972.

Synonymy: Glandularia guaranitica Troncoso, *Darwiniana* 16: 618--621, fig. 3. 1971.

Bibliography: Troncoso, *Darwiniana* 16: [613], 614, & 618--621, fig. 3. 1971; Moldenke, *Phytologia* 23: 211. 1972.

Illustrations: Troncoso, *Darwiniana* 16: [619], fig. 3. 1971.

This species is based on A. Burkart 8028, collected at Tres Cerros, dept. San Martín, Corrientes, Argentina, on November 8, 1936, and is deposited in the herbarium at San Isidro. Mrs. Burkart records for it the vernacular name "margarita" and gives its geographic distribution as "Misiones y Corrientes en la Argentina; Paraguay. Habita en rozados y terrenos altos a orillas de bosques." She makes the following comments: "Agradezco al Ing. Benno Schnack de la Universidad Nacional de La Plata, los ejemplares de Misiones y de Corrientes de esta especie y sus afines, que me proporcionó para su estudio, así como varias observaciones sobre las mismas, las que tiene en cultivo en el jardín experimental de la Facultad de Agronomía de La Plata.... G. guaranitica además de su afinidad ya señalada con G. megapotamica y G. phlogiflora, podría confundirse por su hábito y aspecto con G. incisa (Hook.) Tronc., especie que difiere fundamentalmente por sus inflorescencias que se alargan en forma notable después de la antesis, por la ausencia de glándulas conectivas y por sus flores de color rojo-solferino.... Hassler, en Chod. et Hassl., *Pl. Hassler*: 477. 1904, reconoce Verbena megapotamica var. tweediana O. Ktze. Su interpretación de esta variedad correspondería a Glandularia guaranitica. Me baso para afirmarle en uno de los ejemplares citados por este autor (Hass-

ler 3293 de Paraguay, Caragatay), que he visto en el herbario de Kew."

She cites the following specimens: PARAGUAY: Fiebrig 6452, Hassler 1466 & 3293, Osten 13571, T. Rojas 1882. ARGENTINA: Corrientes: Burkart 8028 (type collection). Misiones: Grondona & Spegazzini 1231, Issouribehere s.n. [Posadas], A. de Llamas s.n. [Santa Ana, Candelaria], F. M. Rodriguez 30.

VERBENA GYNOBASIS Wedd.

Additional & emended bibliography: Reiche & Phil., Fl. Chil. 5: 285 & 286. 1910; J. F. Macbr., Field Mus. Publ. Bot. 13 (5): 617 & 618. 1960; Moldenke, Phytologia 14: 284. 1967; Moldenke, Fifth Summ. 1: 143, 184, & 193 (1971) and 2: 653 & 915. 1971; Moldenke, Phytologia 23: 191. 1972.

Recent collectors have found this plant growing at altitudes of 400 to 3400 meters, flowering and fruiting in October and November, in addition to months previously reported. Macbride (1960) reduces the species to synonymy under V. calcicola Walp., but I regard V. calcicola as a synonym of V. clavata Ruiz & Pav. and quite distinct from the present taxon.

Additional citations: PERU: Arequipa: Vargas Calderón 18227 (Ac). Tacna: Vargas Calderón 13068 (Rf). CHILE: Tarapacá: Zöllner 4088 (Go).

VERBENA GYNOBASIS var. STRIGOSA Wedd.

Additional bibliography: Moldenke, Phytologia 11: 459. 1965; Moldenke, Fifth Summ. 1: 143 (1971) and 2: 672 & 915. 1971.

VERBENA HALEI Small, Bull. Torrey Bot. Club 25: 617—618. 1898.

Additional synonymy: Verbenna halei Small ex Moldenke, Fifth Summ. 2: 708, in syn. 1971.

Additional & emended bibliography: J. K. Small, Bull. Torrey Bot. Club 25: 617—618. 1898; Hocking, Excerpt. Bot. A.1: 430. 1959; Howell & McClintock in Kearney & Peebles, Ariz. Fl., ed. 2, 726 & 728. 1960; Lewis & Oliv., Am. Journ. Bot. 48: [639]—641, fig. 16. 1961; Hocking, Excerpt. Bot. A.6: 91. 1963; Radford, Ahles, & Bell, Guide Vasc. Fl. Carol. 281 & 282. 1964; Shinners, Sida 3: 182. 1967; Moldenke, Phytologia 16: 187 & 190. 1968; Moldenke, Résumé Suppl. 16: 2. 1968; Pullen, Jones, & Wats., Castanea 33: 332. 1968; Bolkh., Grif, Matvej., & Zakhar., Chrom. Numb. Flow. Pl. 717. 1969; D. F. Costello, Prairie World 24. 1969; Muehlenbach, Ann. Mo. Bot. Gard. 56: 169—170. 1969; Rickett, Wild Fls. U. S. 3 (2): 364 (1969) and 4 (2): 540 & 799. 1970; Moldenke in Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. Bot. 6:] 1314 & 1318—1319. 1970; Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. Bot. 6:] 1876 & 1877. 1970; Shinners, Sida 3: 554. 1970; Moldenke, Fifth Summ. 1: 23, 25, 27, 30, 32, 33, 45, 47, 49, 53, 58, 62, 63, 75, & 370 (1971) and 2: 663, 672, 674, 679, 680, 685, 686, 698, 708, & 915. 1971; Moldenke, Phytologia 23: 193.

1972.

Emended illustrations: Lewis & Oliv., Am. Journ. Bot. 48: 640, fig. 16. 1961.

Recent collectors describe this plant as an annual herb with fibrous roots or an erect perennial, slender and wiry, 45—60 cm. tall, branched from the base, the branches erect, to 45 cm. long, the leaves shiny-green, the inflorescence very slender, and the flowers small. The corollas are described as having been "pale-blue" on R. Ruryon 2358, "light-blue" on Pilcher 196 & 236, "blue" on B. Hutchins 1049, Pilcher 30, and Stuessy 1013, "lavender-blue" on M. D. McCracken 90, "bluish-lavender" on Ellison & Ellison 1010, "lavender" on B. Hutchins 453 & 1101 and Jeter 11, "light-lavender" on Correll & Mitchell 34452, "violet" on Gipson 81 and McDaniel 3501, and "purple" on Gutiérrez R. 218 and R. Ruryon 2181.

Demaree 58109 is anomalous, tall, the lower leaves numerous on the stem and only sparsely dentate, hardly lobed, and quite pilose beneath — it may represent a hybrid, possibly with V. simplex Lehm. Jones & Reynolds 11740 has some of its spikes fasciated. Wood 721 bears a notation that "plants similar to nos. 692 and 693 but less hairy". B. Hutchins 453 is accompanied by a photograph; Nixon G.60 is an "ecological voucher", according to its collector, while Cumbie 173 is a "voucher for anatomical study".

Rickett (1969) states that "There are several spikes, with rose, blue, lavender, or purple flowers scarcely more than 1/3 inch long", and gives its distribution as "in meadows and woodland and on prairies and hills and roadsides practically throughout the state [of Texas], eastward to Alabama, northward to Oklahoma, and in Mexico", flowering in Texas from "February to November". The species has been found growing at altitudes of 9--5800 feet. Additional common names recorded for it are "slender verbena" and "vervain".

Recent collectors have found the plant growing in loose red or red sandy loam, loose sand in woods around bogs, calcareous clay-loam, sandy-clay of river-bottoms, sandy loam or calcareous clay loam of barditch highways, limestone soil, or in soil derived from granite, in sandy loam, open pasturelands, open oak-mesquite woodlands, or open fields and disturbed areas, in fine sandy soil, deciduous tropical woods, low moist areas of rolling plains, wet spots along highways, and in irrigation ditches, along railroad tracks, in Prosopis-Opuntia communities, on road shoulders and sandy weedy beaches, along the edges of upland mixed hardwoods, and in hilly areas with serpentine mounds vegetated mainly by grasses. Pilcher reports it "occasional among weeds and grasses", while the Ellisons describe it as a "perennial in full sun, sandy soil, abundant local population with V. brasiliensis but no hybridization evident".

In Arkansas it is called "common in waste areas" by Demaree.

Stuessy found it "scarce" in Chihuahua, while in Mississippi Rogers found it "in full sun along roadside and in openings" and McDaniel says that it is "common along roadsides in longleaf pine and oak associations". Mears found it growing with Ambrosia, Cardiospermum, Solanum, and Spartina, while Cory describes it as "frequent" or "infrequent" on roadsides, "frequent in sandy soil of grasslands and onion fields", and "infrequent on highway shoulders". In the state of Texas Strother describes it as a "weed in overgrown lots" (Brown Co.), Waller found it to be "occasional in sandy clay loam of oak woodlands" (Mason Co.), Jeter calls it "common on blackland prairies" (Ellis Co.), and Runyon found it to be "frequent to abundant in open ground" or "occasional in sandy loam" (Kenedy Co.) and comments that it "flowers throughout the summer months, frequent throughout the region" (Cameron Co.).

Stanford reports V. halei from "mostly grassland of sandy to sandy-loam soil in the Campestrian Biotic Province, frequent in all areas" of Wichita Co., Texas. Shinnery (1967) records it from Garza County, citing his nos. 453, 1049, & 1101. Kibler encountered it at 2000 feet altitude in Nuevo León, Mexico.

Howell & McClintock (1960) cites Peebles & Harrison 4224 from Pinal Co. and Goodding & Lusher 186-45 from Pima Co., Arizona. Pullen, Jones, & Watson (1968) record it from Amite, Clarke, Covington, Harrison, Jackson, Jasper, Jefferson Davis, Lauderdale, Marion, Scott, Stone, Wayne, and Wilkinson Counties, Mississippi. Radford, Ahles, & Bell (1964) report it as infrequent along roadsides and in pastures in Warren County, North Carolina, and in Aiken and Sumter Counties, South Carolina, flowering there from April to June.

Muehlenbach (1969) has found this species as an adventive in two freight yards in St. Louis, Missouri, in 1957, 1958, and 1960, but in a letter to me dated March 20, 1970, he says "I tried in the last years desperately to rediscover in St. Louis Verbena halei, but in vain. I left even once two specimens uncollected, but nevertheless this plant disappeared in the following summer. But that is nothing astonishing — so frequently adventive plants vanish on the railroads without obvious reasons."

The H. M. Parker 424, cited below, was collected in a thorn forest and dry stream bed on limestone and shale substratum and was misidentified as Phryma leptostachya L. It is an anomalous specimen which does not have the appearance of typical V. halei.

Material of this species has also been misidentified and distributed in some herbaria under the names V. canadensis L., V. runyoni Moldenke, and Phryma sp. On the other hand, the Sosa 332, distributed as V. halei, is actually V. cloverae Moldenke; Stuessy 1013 is V. gracilis Desf.; E. G. Marsh 684 is V. neomexicana var. hirtella Perry; Matthews & Matthews 310 is V. perennis Wootton; Cuesta 61, N. C. Henderson 61-944, and J. O. Perez 44 are V. plicata Greene; and Thomas, Thomas, Thomas, & Thomas 3347 is

V. xutha Lehm.

Additional citations: SOUTH CAROLINA: Aiken Co.: Ellison & Ellison 1010 (N). MISSISSIPPI: Forrest Co.: S. McDaniel 3501 (N). Hancock Co.: S. B. Jones 11867 (N). Jackson Co.: K. E. Rogers 1093 (N). Lawrence Co.: Jones & Reynolds 11740 (Au—260968). Pearl River Co.: F. H. Sargent 7745 (Go). ARKANSAS: Clark Co.: Demaree 58570 (Ac). Little River Co.: Demaree 58109 (Rf), 58166 (Ac). Miller Co.: Demaree 58076 (Ac), 58081 (Ac), 58083 (Rf). Nevada Co.: Demaree 60103 (Rf). LOUISIANA: Caddo Par.: Demaree 55579 (Ac). Ouachita Par. R. D. Thomas 2825 (N). OKLAHOMA: Atoka Co.: Hopkins, Nelson, & Nelson 1092 (Se—136591). Johnston Co.: G. T. Robbins 2410 (N). Love Co.: Nelson, Nelson, Goodman, & Waterfall 5706 (Se—136609). Pontotoc Co.: G. T. Robbins 2486 (N). TEXAS: Anderson Co.: K. E. Smith s.n. [Palestine, 4/21/35] (Lk). Bastrop Co.: Westlund, Rowell, & Barkley 17T216 (Ip). Bell Co.: M. Latham 7 (Au—247766, Au—248044). Bexar Co.: J. O. Perez 21 (Au—245152, Ip). Bosque Co.: Pilcher 236 (Lk). Bowie Co.: Correll & Mitchell 34452 (Ld). Brazoria Co.: Fleetwood 9010 (Au—260420), 9110 (Au—260428). Brazos Co.: Cory 50627 (Mi); Fryxell 976 (N). Brown Co.: Calhoon 6 (Lk); M. A. Cole 120 (Lk); R. Norton 8 (Au—248404); Strother 10 (Lk); J. Wheeler 14 (Au—247691). Burnet Co.: Cumbie 173 (Lk). Caldwell Co.: Mears 670 (Au—255128). Cameron Co.: R. Runyon 2181 (Au—268811), 2368 (Au—268612). Culberson Co.: Cory 53037 (Mi, N). Dimmit Co.: Atwood 2030 (N, N); Ramirez & Cardenas 3 (Au—245212, Ip). Duval Co.: Alvarez, Guajardo, Salazar, & McCart 7671 (Lk). Eastland Co.: Wheelless 17 (Au—247705). Ellis Co.: Jeter 11 (Lk). Frio Co.: Alvarez, Guajardo, Salazar, & McCart 8020 (Se—220475); Drews 6 (Au—247890); Ramirez & Cardenas 25 (Au—245196, Ip). Galveston Co.: Cory 51017 (Mi); Mears 761 (Au—255271), 793 (Au—255508). Garza Co.: B. Hutchins 453 (Lk), 1049 (Lk), 1101 (Lk). Gillespie Co.: Nixon G. 60 (Au—253187), S. 37 (Au—253234). Harris Co.: E. Hall 432 (N). Hidalgo Co.: Holloway 21 (Au—257886). Jim Hogg Co.: Botello & Ayala 12 (Au—245005). Kenedy Co.: R. Runyon 2358 (Au—266158, Au—268613). Kleberg Co.: Cory 51322 (Mi). Lavaca Co.: Strother 185 (Au—238141). Mason Co.: Gipson 81 (Lk); Waller 1701 (Lk). Matagorda Co.: Cory 51091 (Mi); Mears 1149 (Au—254959). McLennan Co.: L. D. Smith 388 (Au—122207). Medina Co.: J. Cope 26 (Au—247823). Nueces Co.: Bolen 80 (Lk); Pilcher 30 (Lk). Palo Pinto Co.: Mahler 1660 (Au). Robertson Co.: Rowell 8077 (Au—122260). Rusk Co.: M. D. McCracken 90 (Lk). San Patricio Co.: Cory 51259 (Mi, Se—123672); Gould & Hycka 7990 (Lk); S. Sanderson 94 (N). San Saba Co.: L. J. Jones 18 (Au—247795, Au—248124). Starr Co.: Pilcher 196 (Lk); A. D. Wood 721 (Au—247064, Au—262610). Taylor Co.: Mahler 3393 (Au—248882). Tra-

vis Co.: Tharp s.n. [Austin, 5/2/35] (Lk), s.n. [Austin, 5/9/35] (Lk). Webb Co.: Novoa & Cantu 10 (Au--244815, Ip); E. Rodriguez 5 (Au--245037, Ip). Wichita Co.: J. W. Stanford 291 (Lk). Willacy Co.: Cory 51489 (Mi). Wilson Co.: Edw. Palmer 1043 (Pa). Young Co.: Vollum s.n. [Fort Belknap, 1855] (Pa). El Toro Island: Tharp 49098 (Au--122208, N), 49236 (Au--122206). MEXICO: Chihuahua: Stuessy 1013 (Au--257717, N). Coahuila: E. G. Marsh 1625 (Au--213416); E. M. Marsh 2128 (Au--213864). Guanajuato: R. Pearce 2276 (Lk). Nuevo León: Kibler 26 (Au--297427); H. M. Parker 381 (Au--302762), 424 (Au--302763). Veracruz: García Saucedo 45 (Ip); Gutiérrez R. 218 (Ac).

VERBENA HALEI f. ALBIFLORA L. I. Davis

Synonymy: Verbena halei albiflora L. I. Davis ex Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. Bot. 6:] 1876. 1970.

Additional bibliography: Moldenke, Phytologia 9: 175. 1963; Moldenke in Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. Bot. 6:] 1314 & 1319. 1970; Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. Bot. 6:] 1876. 1970; Moldenke, Fifth Summ. 1: 59 (1971) and 2: 672 & 915. 1971.

VERBENA HALEI f. ROSEIFLORA (Benke) Moldenke

Additional synonymy: Verbena halei roseiflora (Benke) Moldenke ex Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. Bot. 6:] 1876. 1970.

Additional bibliography: Moldenke, Phytologia 10: 210. 1964; Moldenke in Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. Bot. 6:] 1314 & 1319. 1970; Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. Bot. 6:] 1876. 1970; Moldenke, Fifth Summ. 1: 59 (1971) and 2: 672, 687, & 915. 1971.

VERBENA HASSLERANA Briq.

Additional synonymy: Glandularia hassleriana Schnack & Rubens, Bol. Soc. Argent. Bot. 13: 205. 1970.

Additional bibliography: Angely, Fl. Anal. Paran., ed. 1, 571. 1965; Moldenke, Phytologia 14: 284. 1967; Schnack & Rubens, Bol. Soc. Argent. Bot. 13: 205. 1970; Moldenke, Fifth Summ. 1: 177, 187, & 201 (1971) and 2: 672, 688, 689, 773, & 915. 1971.

The species has been collected in anthesis in January, in addition to the months previously reported, and Hatschbach describes it as an "erva do brejo". The corollas are said to have been "violet" on Hatschbach 18321 and "red" on G. J. Schwarz 615.

Additional citations: BRAZIL: Paraná: Hatschbach 18321 (Ft, N, W--2536532). ARGENTINA: Misiones: Ruiz Huidobro 4753 (Se--129884); G. J. Schwarz 615 (N), 5162 (N).

VERBENA HASSLERANA var. OVATIFOLIA Moldenke

Additional bibliography: Moldenke, Phytologia 13: 199. 1966;

Moldenke, Fifth Summ. 1: 177 (1971) and 2: 915. 1971.

VERBENA HASTATA L.

Additional & emended synonymy: Verbena americana, spici
multiplici, foliis urticae angustissimis, floribus purpureis
Tourn., Compl. Herb. 358. 1719. Verbena hastata φ pinnatifida
A. Wood, Class-book, ed. 2, pr. 1, 412. 1847. Verbena hastata f.
hastata Seymour, Fl. New Engl. 456. 1969. Verbena urticifolio-
hastata Bebb, in herb.

Additional & emended bibliography: Tourn., Compl. Herb. 358.
1719; Crantz, Inst. Rei Herb. 1: 573. 1766; [Retz.], Nom. Bot. 11:
1772; J. F. Gmel. in L., Syst. Nat., ed. 13, pr. 1, 2 (1): 42
(1789) and ed. 13, pr. 2, 2 (1): 42. 1796; Balbis, Cat. Pl. Hort.
Bot. Taur. 48. 1804; Balbis, Cat. Stirp. Hort. Acad. Taur. 30.
1813; Pers., Sp. Pl. 3: 346 & 347. 1819; Steud., Nom. Bot. Phan.,
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283--284. 1833; A. Wood, Class-book, ed. 1, 268 (1845) and ed. 2,
pr. 1, 412. 1847; Beck, Bot., ed. 2, pr. 1, 285. 1848; A. Gray,
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ed. 10, pr. 3, 412 (1850), ed. 17, 412 (1851), ed. 23, 412
(1851), ed. 29, 412 (1853), ed. 35, 412 (1854), ed. 41, pr. 1,
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3, 298 (1862) and ed. 4, pr. 1, 298. 1863; A. Wood, Class-book,
[ed. 42], pr. 2, 537. 1863; A. Gray, Man. Bot., ed. 4, pr. 2,
298. 1864; A. Wood, Class-book, [ed. 42], pr. 3, 537. 1865; Dar-
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Beck, Bot., ed. 2, pr. 3, 285. 1868; A. Gray, Man. Bot., ed. 5,
pr. 2, 340. 1868; A. Wood, Class-book, [ed. 42], pr. 5, 537.
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and ed. 1, pr. 2, 242. 1869; A. Wood, Class-book, [ed. 42], pr.
6, 537 (1869) and [ed. 42], pr. 7, 537. 1870; A. Gray, Man. Bot.,
ed. 4, pr. 3, 298. 1870; A. Wood, Am. Bot. & Flor., ed. 1, pr. 1,
236 (1870) and ed. 1, pr. 2, 236. 1871; A. Wood, Class-book, [ed.
42], pr. 8, 537. 1872; A. Wood, Am. Bot. & Flor., ed. 1, pr. 3,
236 (1872), ed. 1, pr. 4, 236 (1873), ed. 1, pr. 5, 236 (1874),
and ed. 1, pr. 6, 236. 1875; A. Wood, Class-book, [ed. 42], pr.
9, 537. 1876; A. Gray, Man. Bot., ed. 5, pr. 8, 340 (1878) and
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[to be continued]

THE TAXONOMY OF ZEA MAYS (GRAMINEAE)

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The origin of maize has long been disputed. Of the various theories, the oldest postulates its direct origin by ancient human selection from a wild grass of the genus Euchlaena, the "Teosinte" of Mexico and Guatemala; i.e. maize is simply regarded as a highly domesticated and variable cultivar of Euchlaena. The morphological steps, first clearly outlined by G.N. Collins (J. Agr. Res. 17: 127-135. 1919), were discussed but not accepted by P.C. Mangelsdorf (Bot. Mus. Leaflet. Harvard Univ. 12: 33-75. 1945) and amplified by W.C. Galinat (An. Rev. Gen. 5: 447-478. 1971) and myself (H.H. Iltis The Maize Mystique. 5 pp. mimeo MS. 1970; cf. Galinat, loc. cit. pp. 450, 462). The genetic reasons were first outlined by G. Beadle (J. Hered. 30: 245-247. 1939).

The close relationship of Euchlaena to Zea was taxonomically formalized by Reeves and Mangelsdorf (Am. J. Bot. 29: 815-817. 1942), who transferred its two accepted species to Zea. Of these, the perennial tetraploid Z. perennis is the most primitive and distinctive in the genus. The diploid annual Z. mexicana sensu lato, however, contains two major elements: the Tripsacum-like, more primitive "Florida" Teosinte (E. luxurians) from Guatemala, which does not cross as readily with maize and other Teosinte forms, and which deserves separate subspecific status (see below); and the remaining races (cf. H.G. Wilkes, Teosinte: the closest relative of Maize. Bussey Inst. Harvard. 158 pp. 1967) which cross with close to 100% fertility with maize, and are best considered, for the time being, under but one subspecies, conspecific with maize as suggested by C.D. Darlington (Chromosome Botany. Allen and Unwin, London. pp. 130-131. 1956):

"The breeding and chromosome evidence ... agree in requiring that Euchlaena mexicana and Zea mays should be described as one species, the wild grass being today an authentic and scarcely changed representative of what the ancestor of Zea mays must have been."

The new combination, made informally by Iltis (loc. cit.), was validly published in Galinat (loc. cit. p. 450), who, however, neglected to cite the basonym date and place of publication, an oversight rectified below. Further study may in addition demand separate subspecific recognition of other Zea mays.

ances, especially the "Rio Balsas" and "Chalco" populations. (cf. Wilkes, loc. cit.).

Synopsis of Zea

1. Zea mays L. ssp. mays
2. Zea mays L. ssp. mexicana (Schrad.) Iltis, in Galinat, An. Rev. Gen. 5: 450. 1971.
(based on Euchlaena mexicana Schrader, Index Sem. Hort. Goett. 1832; Linnaea 8: 25. 1833).
3. Zea mays L. ssp. luxurians (Durieu) Iltis, stat. et comb. nov.
(based on Euchlaena luxurians Durieu, Bull. Soc. d'Acclimat. 19: 581. 1872).
4. Zea perennis (Hitchcock) Reeves et Mangelsdorf.
(based on Euchlaena perennis Hitchcock).

BOOK REVIEWS

Alma L. Moldenke

"ORGANISM AND ENVIRONMENT - A Manual of Quantitative Ecology" by Reznat M. Darnell, x & 290 pp., illus., F. H. Freeman & Co., San Francisco, California 94104. 1971. \$5.75 paperback with looseleaf adaptation.

This intelligently planned manual adaptable to advanced ecology courses plans 25 laboratory and/or field experiments covering a wide range of organisms and the following branches of ecology -- morphological, physiological, behavioral, population and community. Illustrations, careful directional questions and bibliographies enrich this work which has been previously tried out on the author's students.

There is also the author's 47-page "Instructor's Guide" available from the same publisher. It could also serve as an additional guide to advanced students doing some or one of the long term experiments.

"HOW TO KNOW THE TREES", 2nd edition, revised, by Howard A. Miller & H. E. Jaques, viii & 302 pp., illus., William C. Brown Company, Publishers, Dubuque, Iowa 52001. 1972. \$4.25 paper covered & spirally bound.

This is a reborn member of that most helpful "Picture Key Nature Series" for amateurs, students and scientists wanting help in easy but accurate identification work. To the first edition of 1941 and its reprinting in 1946 have been added new species, updated taxonomy, and a whole new orientation of the tree not only as an individual specimen but also as a member of the forest ecosystem. There is also carefully garnered material on forest insect and fungal pests, results of air pollution, dendrochronology and record specimens.

There are pictured keys for the identification of the more common trees and for winter time identification, the typical picture glossary of this series, indexes of common and scientific names covering 312 species, varieties and hybrids of native and exotic trees. On p. 7 medullary is misspelled and color is given in its British form. The line drawings of key characteristics and the geographic distribution maps are well done.

"ENVIRONMENT AND EVOLUTION -- A Symposium on the Occasion of the One-Hundredth Anniversary of the Foundation of the Peabody Museum of Natural History at Yale University", edited by Ellen T. Drake, xvi & 470 pp., illus., Yale University Press, London & New Haven, Connecticut 06520. 1968. 135 sh or \$15.00

These papers are 16 of the invitation papers presented by outstanding scientists at this symposium in October 1966. They cover basic problems in many different fields of natural history such as origins of the Metazoa, early history of land plants, paleoecology of fossil spores, origins of thermoregulation, environmental photoperiod and the programming of insect development, and outcrossing in natural populations. They all make thoughtful reading. They all are meant to be "examples of the type of exciting and stimulating research work that we wish to see undertaken within or associated with museums of earth and life sciences in future years."

"FUNDAMENTALS OF MYCOLOGY" by J. H. Burnett, xiii & 546 pp., illus. St. Martin's Press, New York, N. Y. 10010. 1968. \$13.95.

Since the classic De Bary work, now dated in part, there has been a long wait for this excellent, well organized, definitive text which enumerates the general features common to all (or most) fungi and to expound the broad trends in structure, function and behavior which can be discerned in the group "of living organisms constructed wholly of fine tubes".

The book is organized into four sections: (1) on structure and growth of cells, hyphae, colonies and reproductive structures; (2) on function in nutrition, transportation, translocation, transpiration, carbohydrate catabolism, other metabolites and ecological factors; (3) on recombination in mitosis, meiosis, parasexual and sexual cycles; and (4) on speciation and evolution.

There are an appendix with classification of the fungi mentioned and indexes of references, authors and subjects. The illustrations are plentiful and of fine quality.

"MORPHOLOGY OF VASCULAR PLANTS" by David W. Bierhorst, xii & 560 pp., illus., Macmillan Company, London & New York, N. Y. 10022. 1971. \$14.95.

With over 2000 illustrations, including 70 percent original publications of the author, and with a critically fine text, Dr. Bierhorst has presented one of the two most outstanding texts in this field. The other is by Dr. Katherine Esau, is not even mentioned in this work, and has a different emphasis. Therefore they do not duplicate but rather supplement each other very well for advanced study in this field.

On the market now there are a few new books in this field with excellent illustrations. They are mainly pictorial albums. This one gives the readers a careful survey of the author's studies on Equisetum, Psilotum and Schizaea. It shows the integrative relationship between ontogeny, phylogeny, physiology and systematics, each with morphology. The book stresses the pre-angiosperm vascular plants starting with the Lycopodiaceae.

"ANALYSIS OF TEMPERATE FOREST ECOSYSTEMS" edited by David Reichle, xii & 304 pp., illus., Springer Verlag, Heidelberg, Germany & New York, N. Y. 10010. 1970. \$14.50.

This first volume of "Ecological Studies" is composed of eighteen thoughtful papers presented at the workshop-seminar at Gatlinburg, Tennessee, in the summer of 1968 co-hosted by the United States International Biological Program's analysis of ecosystems project and the Oak Ridge National Laboratory. The outstanding contributors are about two-thirds from the United States with the rest from eight different countries.

The editor in his preface claims "What the authors have striven for has been the conceptual development and practical application of an 'attitude' — the interrelation of ecosystem parts which form a whole greater than the summation of its structures and processes, and that this whole, the ecosystem, is the meaningful organizational unit for ecological understanding of the environment." The papers are grouped as follows: (1) analysis of ecosystems — quantitatively, qualitatively, phenologically; (2) primary producers — biomass, harvesting methods, metabolic productivity models; (3) consumer organisms in their roles as secondary production — canopy insects, birds, mammals; (4) decomposer populations — floral and faunal; (5) nutrient cycling — micronutrients, minerals, carbon; (6) hydrologic cycles — precipitation, evapotranspiration, models.

Each paper has its own carefully prepared bibliography. There is a subject index of world ecosystems and back cover map based on one of Bazilevich's works of 1969.

"PLANT SPECIATION" by Verne Grant, x & 435 pp., illus., Columbia University Press, London & New York, N. Y. 10025. 1971. \$15.00.

This book will surely become a biological classic as has its predecessor, "The Origin of Adaptations", of 1963 which dealt mostly with diploid sexual organisms. "Plant Speciation" describes the "evolutionary processes and patterns across the board in higher plants (naturally neither diploid nor sexual) as they occur in the various diverse types of genetic systems," dealing "at some length with the divergence and refusion of plant species" and "the bearing of these processes on plant macroevolution."

The book is divided into the following parts: (1) Nature of Species, (2) Divergence of Species, (3) Refusion and its Consequences, (4) Derived Genetic Systems, and (5) Evolution of Hybrid Complexes. The bibliography is of real value. The separate indexes are for organisms, authors, and subjects.

Extrapolating from plant microevolution to angiosperm phylogeny, "the pattern of reticulate evolution revealed by genetic and taxonomic studies of species groups can shed some light [convergence] on the problems surrounding the phylogenetic

classification of the higher categories....Evolutionary convergence can be brought about by selection without hybridization, or by the joint action of hybridization and selection...The facility with which different plant groups can make a transition from one ecological niche to another, so as to yield convergences in whole character combinations, is demonstrated by hundreds of examples.. Change-overs or quantum shifts which are major in ecological terms but relatively minor in genetical terms, can occur repeatedly in different phyletic lines under the guiding influence of parallel selection alone. Within the limits of crossability the production of convergences is stimulated still further by hybridization."

"THE PESTS OF PROTECTED CULTIVATION — The Biology and Control of Glasshouse and Mushroom Pests" by N. W. Hussey, W. H. Read & J. J. Hesling, viii & 404 pp., illus., American Elsevier Publishing Company, New York, N. Y. 10017. 1970. \$26.00.

The authors' stated purpose is the updating and enlarging of the now 20 years old "Insect Pests of Glasshouse Crops" by Miles. This they have achieved very effectively by adding assistance for the expanding mushroom industry, ample newer illustrations, the phytotoxicity factors of pesticides, immunizations to certain chemical controls, and the advantages of biological controls. Glasshouse pests, their effects and control, are arranged systematically, as are those of mushroom cultures.

There are appendices for chemicals used in pest control, tolerances of plants to pesticides, abbreviations, equivalents and dilution tables. There is also a good index.

While planned for the United Kingdom, the information is applicable to many other areas.

"BRITISH STEM- AND LEAF-FUNGI (Coelomycetes)" by W. B. Grove, Volume I, xx & 488 pp., illus., Vol. II, ix & 407 pp., illus., Verlag von J. Cramer, Lehre 3301, Germany. Reprint 1967. \$16.50 paperbound.

The first volume of this fine work initially appeared from the Cambridge University Press in 1935 and the second volume in 1937. Therefore they have not been easily available for quite some time. Volume I covers the Sphaeropsidales to the end of the Sphaerioidae with colorless spores, Volume II completes the Sphaeropsidales and treats the Melanconiales -- all in the Fungi Imperfecti. The very clear text helps make up for the paucity of illustrations.

There are helpful indexes of the Ascomycetes considered by some other authors to be Coelomycetes, of hosts, and of the binomial names of the Coelomycetes treated.

It is indeed fortunate to have this valuable mycological study readily available again. Now more folks will be able to

enjoy reading the peppery and valid epilogue. It is available not only from the publisher but also from Wheldon & Wesley Ltd. in Codicote and from Stechert-Hafner in New York City.

"GLOBAL ECOLOGY — Reading toward a Rational Strategy for Man" by John P. Holdren & Paul R. Ehrlich, viii & 295 pp., illus., Harcourt Brace Jovanovich, Inc., Chicago, San Francisco, Atlanta & New York, N. Y. 1971. \$4.50 paperback.

"The book should be suitable for supplementary reading in courses in both the biological and sociological sciences, and in the many multidisciplinary programs in human ecology now springing up in colleges across the country. The concerned layman with some previous exposure to discussions of populations, resources and environment will also find much of interest here." True indeed for this proverbial 'needle in the haystack'! It points to and pricks the important, not over-simplified issues poignantly and intelligently in sharp contrast to so many of the ecologically oriented paperbacks with only straw-like contents. The editors and many of the authors have long been leaders of world renown for their efforts to alert scientists, political leaders and the general public to resource realities, environmental roulette, threatened species, technological circuses, psycho-social complications, prospects for a sane economics, a population policy, what we must do, and the cost of failure — all the topics under which this important collection of 39 essays is organized.

"ELECTRON MICROSCOPY AND PLANT ULTRASTRUCTURE", by A. W. Robards, iv & 298 pp., illus., McGraw-Hill Book Company, London, Toronto, Sydney, Mexico, Panama, Johannesburg, Singapore and New York, N. Y. 10036. 1970. \$10.95.

This book should supplement effectively many different botany and microbiology courses and the reading of many scientists and educated persons.

"Biological electron microscopy is an exciting and expanding field of research, but it cannot be studied most successfully in isolation. It is but a single technique in the armoury of the modern biologist." The beginning three chapters with their clear-cut exposition can make "the reader thoroughly familiar with current methods of electron microscopy so that he may appreciate with greater perception and enjoyment the micrographs presented for study". Later chapters describe the following individual components of plant cells: membranes, nucleus, mitochondria, plastids, golgi apparatus, endoplasmic reticulum and their related ribosomes, lysosomes, spherosomes, flagella and their related microtubules, cell walls, and variations in ultrastructure of different types of higher plant cells. The final chapters by other authors deal with algae, fungi, bacteria, bluegreen algae and viruses.

Many fine illustrations, selective bibliography, glossary and index are provided.

"HAYFEVER PLANTS — their Appearance, Distribution, Time of Flowering and their Role in Hayfever", 2nd revised edition, by Roger P. Wodehouse, ix & 280 pp., illus., Hafner Publishing Company, New York, N. Y. 10022. 1971. \$14.95.

This valuable book has been brought up-to-date mainly by additional information about causal species and by a greater, nearly worldwide geographic range. The United States and especially its southern California still register the greatest number of cases. The causal plants have anemophilous or amphiphilous flowers with buoyant, abundant and allergenic toxic pollen which tends to be genus- rather than species-specific. The most important are grasses and weeds in the Gramineae, Compositae, Chenopodiaceae, Amaranthaceae, Plantaginaceae, Polygonaceae and trees and shrubs in the Cupressineae, Betulaceae, Platanaceae, Fagaceae, Ulmaceae, Moraceae, Juglandaceae, Salicaceae, Aceraceae and Oleaceae.

The chapter on botanical literature, while sufficient for its purpose, does not list any of the outstanding works which appeared after 1950.

The plants are arranged systematically by families, described, located, often illustrated for inflorescences and pollen grains with the time of their shedding also recorded.

Regional surveys, compiled largely from reports throughout large areas of our earth with ten sections for the United States, give seasonal reports of affecting pollen, fungal spores, "dust" and climate asthma.

There is a particularly good bibliography (with the word diffusion misspelled on p. 268). There are a helpful glossary and a far from complete index.

"OUR NORTHERN SHRUBS and How to Identify Them" by Harriet L. Keeler, xxx & 539 pp., illus., Replication Edition by Dover Publications, Inc., New York, N. Y. 10014. 1969. \$3.75.

This is a welcome unabridged republication of Charles Scribner's Sons edition of 1903 to which has been added fortunately a new appendix of nomenclatural changes by Dr. Voss of the University of Michigan Herbarium. It includes about 230 native, naturalized and garden shrubs in almost 50 different plant families. All are simply, accurately and attractively described and located. There are over 200 full-page black/white photographs that have lost very little definition in this printing process; diagnostic features show up clearly.

This book has had much appeal to armchair and field botanists and naturalists throughout this century. With this new and delightfully inexpensive printing, many more can be pleased.

"PLANT LIPID BIOCHEMISTRY — The Biochemistry of Fatty Acids and Acyl Lipids with Particular Reference to Higher Plants and Algae" by C. Hitchcock and B. W. Nichols, xiii & 387 pp., illus., Academic Press, London NW17DU & New York, N. Y. 10003. 1971. £6.50 or \$19.00.

This is the fourth volume of *Experimental Botany: An International Series of Monographs* under the consulting editorship of J. F. Sutcliffe and P. Mahlberg. It encompasses the research work especially of the past fifteen years into a coordinated, well-explained picture of the structure, distribution and metabolism of acyl lipids and fatty acids in higher plants and algae. It also makes comparisons with related results obtained in mammalian and microbial metabolism.

The chapters cover (1) major, minor and unusual fatty acids, (2) acyl lipids such as glycerides, diols, acyl esters, sphingolipids and cutin, (3) their presence in specific tissues of higher plants, mosses, ferns and algae, (4) lipids in seeds, underground structures and chlorophyllous tissue, (5) biosynthesis of carboxylic acids, saturated and unsaturated fatty acids, (6) biosynthesis of glyceride and other acyl lipids, (7) lipolytic enzymes, (8) biological degradation of fatty acids by Alpha-, Beta- and Omega-oxidation, (9) metabolic changes during senescence and organogenesis, (10) lipids in membrane structure and function, energy storage, ethylene production, and (11) fractionation and analysis of the lipids and their components.

In addition to a very detailed bibliography, author index and subject index there are "Supplementary Readings" of a more general scope and "More Recent Publications Not Considered in the Text" arranged according to the chapters. The work is a veritable storehouse of information on plant lipid metabolism.

"ECOLOGY OF LEAF SURFACE MICRO-ORGANISMS" edited by T. F. Preece & C. H. Dickinson, xvii & 640 pp., illus., Academic Press, London NW17DU & New York 10003. 1971. \$26.00.

The 47 papers printed here were presented as the proceedings of an international symposium at the University of Newcastle upon Tyne, September 1970 by active workers in the field of leaf surface studies. They are grouped into the following five sections, each followed by the recorded interesting discussions: (1) characteristics of leaf surfaces - anatomically, chemically, physically, climatically - with several excellent electron micrographs, (2) saprophytes on leaf surfaces, (3) pathogens on leaf surfaces, (4) microbiology of senescing leaves, and (5) interactions on the leaf surface - host exudates, phytoalexins, antagonisms, inhibitions, nitrogen fixation.

Each paper carries its own bibliography. Author, systematic and subject indexes are carefully prepared. Under the cover title "ecology" much valuable isolated material is herein well integrated in terms of basic science and is well organized for those studying the role of leaf surface in crop protection & plant pathology.

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ADDITIONAL NOTES ON THE GENUS VERBENA. XII

Harold N. Moldenke

VERBENA [Dorst.] L.

Additional synonymy: Vervena Kundu & De, Bull. Bot. Surv. India 10: 399, sphalm. 1968.

Additional & emended bibliography: Virgil., Eccl. 8: v. 64--65. B.C.37; Propertius, Eleg. 4 (3): v. 57--58. B.C.26; Virgil., Aeneid 12: v. 119--120. B.C.19; Plin. Secund., Hist. Mund. Nat., lib. 22, cap. 2. A.D.77; Camer. in Matth., Pl. Epit. Util. 717. 1586; L., Mat. Med., ed. 1, 6, 208, & 218. 1749; Manetti, Virid. Florent. 98. 1751; Schreb. in L., Mat. Med., ed. 2, pr. 1, 38 & [272]. 1772; W. Curtis, Fl. Lond., ed. 1, 1 (1): pl. 41 ["42"]. 1775; O. F. Müll. in Oeder, Icon. Pl. Fl. Dan. 4: 5, pl. 628. 1775; Bulliard, Herb. France pl. 215 & table. 1785; Schreb. in L., Mat. Med., ed. 5, 41 & [324]. 1787; Mavor, Gen. View Agr. Berks. 1809; Sibth. & Sm., Fl. Graec. Prodr. 1 (2): 402. 1809; Targ.-Tozz., Diz. Bot. Ital. 2: 233. 1809; W. Curtis, Fl. Lond., ed. 2, 1 (1): pl. 41. 1817; Zerapha, Fl. Melit. Thes. 2: 77. 1831; W. Curtis, Fl. Lond., ed. 2, 3: pl. 90. 1835; Bertol., Fl. Ital. 6: 261. 1844; Schau. in A. DC., Prodr. 11: 535--557 & 736. 1847; Grech Delicata, Fl. Melit. 27. 1853; Gulia Gavino, Repert. Bot. Malt. 7. 1855; Reichenb., Icon. Fl. Germ. 18: 52--53, pl. 91 (1292) & 103. 1857; Boswell Syme in Sowerby, Engl. Bot., ed. 3, 6: 202--203, pl. 1018. 1866; Nyman, Consp. Fl. Eur. 563. 1881; Arcang., Compend. Fl. Ital., ed. 1, 561 & 885. 1882; Baker & Newbould in H. C. Wats., Topogr. Bot., ed. 2, 302. 1883; Druce, Fl. Oxf. 224. 1886; Arcang., Compend. Fl. Ital., ed. 2, 444--445 & 31. 1894; T. Cooke, Fl. Presid. Bomb. 2: 437. 1908; Hatton, Craftman's Plant-book 4, 368, 369, & 538, fig. I & 729. 1909; Dur. & Barr., Fl. Lib. Prodr. 193. 1910; Béguinot & Vacc., Monog. Rapp. Colon. Minist. Aff. Est. Roma 16: [Contrib. Fl. Libia] 62. 1912; Hubert, Verbénac. Util. Mat. Méd. 8--15. 1921; Holste, Arch. Exp. Path. Pharmacol. 101: 46. 1924; Pamp., Libya 3: 145. 1927; Miller, Journ. Am. Pharm. Assoc. 17: 744. 1928; Grove, Brit. Stem- & Leaf-fungi, pr. 1, 1: 414 & 470. 1935; Noack, Biol. Zentralbl. 57: [383]--388, fig. 1--17. 1937; Cheymol, Bull. Soc. Chem. 5: 633 & 642. 1938; Furusato, Bot. & Zool. Theoret. & Appl. [Syokobutu Oyobi Dobutu] 8: [1303]--1311 (39--47). 1940; W. Hoffm., Arch. Pharm. 231: 269. 1943; E. L. D. Seymour, New Gard. Encycl., ed. 3, 1279 & 1281 (1944) and ed. 4, 1279 & 1281. 1946; E. L. Jordan, Hamond Nat. Atl., pr. 1, 2, & 3, 219 (1952) and pr. 4, 5, & 6, 219. 1953; Schnack & Solbrig, Revist. Fac. Agr. La Plata 29: [255]--266, fig. 1--4. 1953; E. L. Jordan, Hamond Nat. Atl., pr. 7, 219 (1954), pr. 8, 219 (1955), pr. 9 & 10, 219 (1956), pr. 11, 219 (1957), pr. 12, 219 (1958), and pr. 13, 219. 1959; Hatton, Handb. Pl. & Flor. Ornament 4, 368--369, & 538, fig. I & 729. 1960; Büchi & Manning, Tetrahedron Lett. 1960: 5. 1960; E. L. Jordan, Hamond Nat. Atl., pr. 14, 219 (1961) and pr. 15, 219. 1962;

Büchi & Manning, *Tetrahedron* 18: 1049. 1962; Newcomb, *Pocket Key Comm. Wild Fls.* 24, 56, 64, & 65. 1963; E. L. D. Seymour, *New Gard. Encycl.*, ed. 6, 1279 & 1281, pl. 59 (1963) and ed. 7, 1279 & 1281, pl. 59. 1964; E. L. Jordan, *Hamond Nat. Atl.*, pr. 17, 219 (1964) and pr. 18, 219. 1965; Huynh, *Denkschr. Schweiz. Naturforsch. Gesel. [Mém. Soc. Helv. Sci. Nat.]* 85: 100. 1965; E. L. Jordan, *Hamond Nat. Atl.*, pr. 19, 219 (1966) and pr. 20, 219. 1967; Grove, *Biblioth. Mycol.* 42: 444 & 470. 1967; Kundu & De, *Bull. Bot. Surv. India* 10: 399. 1968; R. I. Patel, *For. Fl. Melghat* 271. 1968; E. L. Jordan, *Hamond Nat. Atl.*, pr. 21, 219. 1969; E. L. D. Seymour, *New Gard. Encycl.*, ed. 8, 1279 & 1281. 1970; Angely, *Fl. Anal. Fitogeogr. Est. S. Paulo*, ed. 1, 4: 825, 826, 836--840, & xix, maps 1391--1395. 1970; Reed & Hughes, *Common Weeds U. S.*, pr. 1, 306--309, fig. 151 & 152 (1970) and pr. 2, 306--309, fig. 151 & 152. 1971; Hocking, *Excerpt. Bot. A.* 18: 444. 1971; E. L. Jordan, *Hamond Nat. Atl.*, pr. 22, 219. 1971; Vyas & Garg, *Zeit. Pflanzenphysiol.* 65: 189--194. 1971; Priszter, *Delect. Sem. Spor. Pl. Hort. Bot. Univ. Hung.* 59 & 81. 1971; C. D. Adams, *Flow. Pl. Jam.* 626--628, 630--632, & 846. 1972; Anon., *Biol. Abstr.* 53 (3): B.A.S.I.C. S.271. 1972; Vyas & Garg, *Biol. Abstr.* 53: 1650. 1972; Moldenke, *Phytologia* 23: 211--247. 1972.

The Sibthorp & Smith reference (1809) is often cited as "1806", but pages 219--442 of this work were issued in 1809. The Boswell Syme reference (1866) is sometimes cited as "1863", but volume 6 of this edition was not issued until 1866.

VERBENA ALATA Sweet

Additional bibliography: Angely, *Fl. Anal. Fitogeogr. Est. S. Paulo*, ed. 1, 4: 838 & xix. 1970; Moldenke, *Phytologia* 23: 213. 1972.

VERBENA AMBROSIFOLIA Rydb.

Additional & emended bibliography: Darlington & Wylie, *Chrom. Atl.*, pr. 1, 323 (1956) and pr. 2, 323. 1961; Moldenke, *Phytologia* 23: 213 & 228. 1972.

VERBENA BERTERII (Meisn.) Schau.

Additional bibliography: Moldenke, *Phytologia* 23: 182 & 230. 1972.

Additional citations: CHILE: Colchagua: Zöllner 5351 (Ac).

VERBENA BIPINNATIFIDA Nutt.

Additional bibliography: Vyas & Garg, *Zeit. Pflanzenphysiol.* 65: 189--194. 1971; Vyas & Garg, *Biol. Abstr.* 53: 1650. 1972; Moldenke, *Phytologia* 23: 215--216 & 226. 1972; Anon., *Biol. Abstr.* 53 (3): B.A.S.I.C. S.271. 1972.

Vyas & Garg (1971) report that seeds of this species stored dry for 47 weeks developed light sensitivity. "GA at a 100-ppm concentration and 30 C incubation temperature provided the optimum conditions for germination. GA was capable not only of bypassing the light requirements but also of overcoming some of the temperature blocks of germination. Coumarin and far-red reversed the stimula-

tion caused by GA. Preheating of seeds at 60 C abolished subsequent GA sensitivity of germination of those seeds in the dark. Nitrogenous substances accelerated the dark germination of the seeds induced by GA." "GA", of course, is gibberelic acid.

VERBENA BONARIENSIS L.

Additional & emended bibliography: Noack, Biol. Zentralbl. 57: 384 & 386, fig. 11. 1937; Darlington & Wylie, Chrom. Atl., pr. 1, 323 (1956) and pr. 2, 323. 1961; Huynh, Denkschr. Schweiz. Naturforsch. Gesel. [Mém. Soc. Helv. Sci. Nat.] 85: 100. 1965; Angely, Fl. Anal. Fitogeogr. Est. S. Paulo, ed. 1, 4: 838 & xix, map 1391. 1970; Moldenke, Phytologia 23: 216--217 & 233. 1972; C. D. Adams, Flow. Pl. Jam. 627, 628, & 846. 1972.

Additional illustrations: Noack, Biol. Zentralbl. 57: 386, fig. 11. 1937.

Adams (1972) states that in Jamaica this species is "Locally common....at roadsides and in old cultivations or gravelly waste open places", growing at altitudes of 1700 to 5200 feet, flowering and fruiting for most of the year. He gives its overall distribution as "Native of subtropical S. Amer., introduced into Bermuda, United States, Puerto Rico and elsewhere and escaping from cultivation". He cites from Jamaica Adams 6431, Harris 9132, Jamaican Plants 1169, and Proctor 23518.

VERBENA BONARIENSIS var. CONGLOMERATA Briq.

Additional bibliography: Angely, Fl. Anal. Fitogeogr. Est. S. Paulo, ed. 1, 4: 838 & xix. 1970; Moldenke, Phytologia 23: 217. 1972.

VERBENA BRACTEATA Lag. & Rodr.

Additional & emended bibliography: Noack, Biol. Zentralbl. 57: [383], 384, & 386, fig. 6. 1937; Reed & Hughes, Common Weeds U. S., pr. 1, 306--307, fig. 151 (1970) and pr. 2, 306--307, fig. 151. 1971; Moldenke, Phytologia 23: 217, 234, 237, & 239. 1972.

Additional illustrations: Noack, Biol. Zentralbl. 57: 386, fig. 6. 1937; Reed & Hughes, Common Weeds U. S., pr. 1, 307, fig. 151 (1970) and pr. 2, 307, fig. 151. 1971.

VERBENA BRASILIENSIS Vell.

Additional bibliography: Angely, Fl. Anal. Fitogeogr. Est. S. Paulo, ed. 1, 4: 838 & xix, map 1391. 1970; Moldenke, Phytologia 23: 217--218, 233, & 241. 1972.

Bayliss describes this plant as 15 inches tall, with rough stems and leaves, growing in sandy grasslands in South Africa.

Additional citations: SOUTH AFRICA: Cape Province: Bayliss BS.3045 (W--2616807).

VERBENA CANADENSIS (L.) Britton

Additional & emended bibliography: Noack, Biol. Zentralbl. 57: 384 & 387, fig. 15. 1937; E. L. D. Seymour, New Gard. Encycl., ed. 3, 1279 (1944), ed. 4, 1279 (1946), and ed. 5, 1279. 1951; Darlington & Wylie, Chrom. Atl., pr. 1, 323. 1956; E. L. D. Sey-

mour, New Gard. Encycl., ed. 6, 1279 (1963), ed. 7, 1279 (1964), and ed. 8, 1279. 1970; Moldenke, Phytologia 23: 218--219 & 242. 1972.

VERBENA CORYMBOSA Ruiz & Pav.

Additional & emended bibliography: Noack, Biol. Zentralbl. 57: 384 & 386, fig. 12. 1937; Darlington & Wylie, Chrom. Atl., pr. 1, 323 (1956) and pr. 2, 323. 1961; Moldenke, Phytologia 23: 220. 1972.

Additional illustrations: Noack, Biol. Zentralbl. 57: 386, fig. 12. 1937.

Although the Darlington & Wylie work (1956) cited above and in the bibliographies of various other species is often cited as "1955" and appears to be so dated by the Library of Congress, the title-page date is "1956" and Mr. Reed, Librarian of the New York Botanical Garden, states that he sees no reason for adopting the earlier date.

VERBENA CRITHMIFOLIA Gill. & Hook.

Additional & emended bibliography: Darlington & Wylie, Chrom. Atl., pr. 1, 323 (1956) and pr. 2, 323. 1961; Bolkh., Grif, Matvej., & Zakhar., Chrom. Numb. Flow. Pl. 715 & 716. 1969; Moldenke, Phytologia 23: 195. 1972.

VERBENA DISSECTA Willd.

Additional & emended bibliography: Darlington & Wylie, Chrom. Atl., pr. 1, 322 (1956) and pr. 2, 322. 1961; Angely, Fl. Anal. Fitogeogr. Est. S. Paulo, ed. 1, 4: 838 & xix. 1970; Moldenke, Phytologia 23: 222--224. 1972.

VERBENA DOMINGENSIS Urb.

Additional bibliography: Moldenke, Phytologia 23: 224. 1972.

Additional citations: *HISPANIOLA*: Dominican Republic: Gastony, Jones, & Norris 363 (W--2657619).

VERBENA EPHEDROIDES Cham.

Additional synonymy: *Verbena sphedroides* Angely, Fl. Anal. Fitogeogr. Est. S. Paulo, ed. 1, 4: xix, sphalm. 1970.

Additional bibliography: Angely, Fl. Anal. Fitogeogr. Est. S. Paulo, ed. 1, 4: 839 & xix, map 1392. 1970; Moldenke, Phytologia 23: 230. 1972.

VERBENA FILICAULIS Schau.

Additional bibliography: Angely, Fl. Anal. Fitogeogr. Est. S. Paulo, ed. 1, 4: 839 & xix, map 1392. 1970; Moldenke, Phytologia 23: 231. 1972.

VERBENA FLAVA Gill. & Hook.

Additional & emended bibliography: Darlington & Wylie, Chrom. Atl., pr. 1, 322 (1956) and pr. 2, 322. 1961; Moldenke, Phytologia 23: 231--232. 1972.

VERBENA GRACILESCENS (Cham.) Herter

Additional synonymy: Verbena offinalis var. gracilescens Cham. ex Angely, Fl. Anal. Fitogeogr. Est. S. Paulo, ed. 1, 4: 839, sphalm. 1970.

Additional & emended bibliography: Darlington & Wylie, Chrom. Atl., pr. 1, 323 (1956) and pr. 2, 323. 1961; Angely, Fl. Anal. Fitogeogr. Est. S. Paulo, ed. 1, 4: 839. 1970; Moldenke, Phytologia 23: 237--238. 1972.

VERBENA HASTATA L.

Additional & emended bibliography: Noack, Biol. Zentralbl. 57: 384--386, fig. 1. 1937; E. L. D. Seymour, New Gard. Encycl., ed. 3, 1279 (1944), ed. 4, 1279 (1946), ed. 5, 1279 (1951), and ed. 6, 1279. 1963; Newcomb, Pocket Key Comm. Wild Fls. 56, 64, & 65. 1963; E. L. D. Seymour, New Gard. Encycl., ed. 7, 1279 (1964) and ed. 8, 1279. 1970; Domville & Dunbar, John Burroughs Nat. Hist. Soc. Bull. 8: 94. 1970; Duncan & Stuckey, Mich. Bot. 9: 190. 1970; El-Gazzar & Wats., New Phytol. 69: 483 & 485. 1970; Harrington in Frankel & Bennett, Genetic Resources 516. 1970; Joyal, Natur. Canad. 97: 577. 1970; Moldenke in Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. Bot. 6:] 1314 & 1319. 1970; Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. Bot. 6:] 1876 & 1877. 1970; Rickett, Wild Fls. U. S. 4 (3): 540, [543], & 799, pl. 177. 1970; Wise, Rhodora 72: 524. 1970; Youngken & Tashiro, Rep. Contr. Research Prop. U. S. Army Med. Res. Develop. Command Washington Contract DA49193MD3037. 1970; Brown & Wherry, Bartonica 40: 13. 1971; Cody, Ind. Sem. Bot. Gard. Ottawa 1971: 20. 1971; Cochran, W. E. & M. M. Rice, Mich. Bot. 10: 183. 1971; Farnsworth, Pharmacog. Titles 5: Cumul. Gen. Ind. 1971; Farnsworth, Pharmacog. Titles 7 (7): xiv & title 12547 (1971) and 7 (8): xix & title 15169. 1971; Krochmal, Walters, & Doughty, U. S. Dept. Agr. Forest Serv. Agric. Handb. 400, pr. 2, 9, 266, & 267. 1971; Ownbey & Monserud, Common Wild Fls. Minn. 312. 1971; Rickett, Wild Fls. U. S. 5 (2): [455], 456, & 665, pl. 152. 1971; Thilenius, U. S. Dept. Agr. Forest Serv. Res. Paper RM.71: 42. 1971; Moldenke, Fifth Summ. 1: 14--23, 25, 27, 30, 34--43, 45, 49--53, 59, 62, 63, 101, 203--205, & 370 (1971) and 2: 548, 649--652, 656, 660, 661, 668, 669, 672--674, 679, 686, 688, 690, 695, 696, 698, 702, 704, 705, 708, 732, 793, 915, & 967. 1971; Moldenke, Phytologia 22: 497 (1972) and 23: 195. 1972.

Additional & emended illustrations: Britton & Br., Illustr. Fl., ed. 2, pr. 1, 3: 95, fig. 3554. 1913; C. A. Reed, Flow. Guide, pr. 1, 152 [in color]. 1916; H. L. Keeler, Wayside Fls. Sum. 174. 1917; C. A. Reed, Flow. Guide, pr. 2, 152 [in color]. 1923; Pammel & King, Iowa Geol. Surv. Bull. 4 (rev.): 267 & 268, fig. 152 & 152A. 1926; Britton & Br., Illustr. Fl., ed. 2, pr. 2, 3: 95, fig. 3554. 1936; Noack, Biol. Zentralbl. 57: 386, fig. 1. 1937; F. H. & H. H. Hillman, Seed Trade Buyers Guide 1938: 137, pl. 12, fig. 6. 1938; Fischer & Harshberger, Flower Fam. Alb. 87. 1941; Britton & Br., Illustr. Fl., ed. 2, pr. 3, 3: 95, fig. 3554. 1943; Harvey, Erickson, & Larson, Seed Trade Buyers Guide 1945: 86. 1945; Britton & Br., Illustr. Fl., ed. 2, pr. 4, 3: 95,

fig. 3554. 1947; Abrams, *Illustr. Fl. Pacific States*, pr. 1, 3: 608, fig. 4341. 1951; Hitchc., Cronq., & Ownbey, *Vasc. Pl. Pacif. Northwest 4*: 246. 1959; Martin & Barkley, *Seed Ident. Man.* 37, pl. 235, & 194, fig. 260. 1961; Hylander, *Fls. Field & Forest* 187, fig. 6. 1962; Rouleau in *Marie-Victorin, Fl. Laurent.*, ed. 2, 489, fig. 170. 1964; F. H. Montgomery, *Plants from Sea to Sea* 261, fig. 528. 1966; Yotaro, *Gard. Pl. World* 3: pl. 64, fig. 3 [in color]. 1966; Abrams, *Illustr. Fl. Pacific States*, pr. 2, 3: 608, fig. 4341. 1967; Gilkey & Dennis, *Handb. NW. Pl.* 352. 1967; Bulkeley, *Berkshire Week* Aug. 10-18, p. [17A]. 1968; W. C. Grimm, *Recog. Flow. Wild Pl.* 229. 1968; Hinds & Hathaway, *Wildfls. Cape Cod* 152, fig. 138. 1968; Peterson & McKenry, *Field Guide Wildfls.* [317] (in color). 1968; Krochmal, Walters, & Doughty, *U. S. Dept. Agr. Forest Serv. Agric. Handb.* 400, pr. 1, 267. 1969; Krochmal, Walters, & Doughty, *U. S. Dept. Agr. Forest Serv. Res. Paper NE.* 138: 267. 1969; Rickett, *Wild Fls. U. S.* 3 (2): [367], pl. 111 [in color] (1969) and 4 (3): [543], pl. 177 [in color]. 1970; Britton & Br., *Illustr. Fl.*, ed. 2, pr. 5, 3: 95, fig. 3554. 1970; Ownbey & Monserud, *Common Wild Fls. Minn.* 312. 1971; Rickett, *Wild Fls. U. S.* 5 (2): [455], pl. 152 [in color]. 1971.

The Madroño (1960) reference in the bibliography of this species is sometimes credited to Solbrig, while Bolkhovskikh (1969) cites it as "Darlington, Document. Chrom. Numb. Pl.....", but it appears to be a continuation of a series begun by Rattenbury and not otherwise accredited since then.

Weber (1967) characterizes *V. hastata* as follows: "Spikes slender, acute at the apex; leaves deep green; flowers deep blue or purple" and describes its habitat as "Swamps and irrigation ditches, piedmont valleys and plains. Common, flowering in late summer" in the Rocky Mountains region. Harrington (1970) has found that its seeds have a life span of 39 years. Poindexter 195-14 was used to determine a chromosome count of $n = 7$ and pollen fertility of 99 percent. Ownbey & Monserud (1971) report that the corollas are "sometimes violet or pink", implying that the normal form is blue. Gilkey & Dennis (1967) describe the flowers as "purplish-blue, opening upward on the spike, only a few flowers of a spike open at one time". Cumbie 89 was used for anatomical studies.

Gattinger (1894) tells us that in Tennessee this species is "Very common in sandy soils", flowering in July, "The herb and root used medicinally".

Grimm (1968) describes the inflorescence as follows: "The small violet-blue flowers, hardly more than 1/8 inch across, are arranged in several long and very slender clusters at the tip of the stem and its branches" and says of the plant that "It is usually common in moist fields, meadows, and along streams; blooming between June and September", giving its range as "N. B. to B. C. south to Fla., Tex., and Calif." Hitchcock, Cronquist, & Ownbey (1959) describe the corolla [of what is probably var. *scabra*] as "blue or violet" and give its habitat in the Pacific Northwest as "Ditch banks and moist low ground" and its range as "B. C. to

N. S., s. to Calif., Ariz., and Fla.", blooming from July to September. Hausman (1948) describes the corollas as "violet-blue, rarely white or pink" and describes the habitat as "Moist fields, meadows, roadsides, waste places. Nova Scotia south to Florida: west to British Columbia, Nebraska, Arizona. June—Sept.". Violet-purple actually seems to be the corolla color in the typical form of this species, but this color usually appears as blue to observers who are red-colorblind. There are, however, distinct blue-flowered, pink-flowered, and white-flowered forms.

Recent collectors have found this plant growing on brushy hillsides, in damp open weedy fields, in cattail thickets along rivulets (in Missouri), in sandy muck (in Oklahoma), on lake margins and in deep sand of dune areas (in Texas), and in damp soils generally. Lowe (1921) found it in "low damp open pastures" in Benton and Pontotoc Counties, Mississippi; Wheeler (1900) records it from Houston County, Minnesota; Dobbs (1963) describes it as "Frequent to common on moist shores and in low moist to wet depressions" in Henry County, Illinois. Rickett (1969) describes its habitat and distribution as "in meadows, fields, prairies, swamps from Nova Scotia across Canada and southward to Florida, Tennessee, Missouri, northern Texas, and California" and comments that "This has been called simpler's-joy, from some medicinal use" [actually this name belongs to V. officinalis L. and has been misapplied to the American V. hastata only in books].

Poindexter encountered V. hastata in "areas characterized by sandy wastes and stabilized sand dune pastures". Radford, Ahles, & Bell (1964) record it from Ashe, Orange, Warren, Washington, and Watauga Counties, North Carolina, and report that the plant grows there in low fields, bogs, and marshes, and is infrequent in North Carolina, blooming there from June to October. Lakela (1965) cites Lakela 11172 & 15624 from Minnesota, while Hutton, Miller, & Conrad (1968) record it from Jefferson County, West Virginia, and Wherry (1967) from Delaware County, Pennsylvania. Hopkins (1969) cites his no. 1022 from Pope County, Illinois, and Mohlenbrock (1968) also reports it from that county; Domville & Dunbar (1970) describe it as "common in damp places" in Ulster County, New York, flowering there "in summer", while Ownbey & Monsrud (1971) aver that it inhabits "Pastures, wet meadows and swamps.....throughout the state" of Minnesota. Cochran (1971) refers to it as "common" in "low open ground" in Rock County, Wisconsin, while Jantzen (1960) reports it from Stafford County, Kansas.

Lowden (1969) found it growing on Squaw Island, Ohio; Joyal (1970) cites Joyal 1217 and Bouleau 1125 from Soeur Island, Quebec; Wise (1970) found it on Isle au Haut in the outermost part of Penobscot Bay, Knox County, Maine, while Duncan & Stuckey (1970) tell us that it was once on Big Chicken and Green Islands, Michigan, since they saw it there in 1939, but that it had disappeared from both islands by 1970. Howell & McClintock (1960) cite Maccougall 566 from Coconino County and Covers & Palmer 279 and Toumey s.n. from Yavapai County, Arizona. St. John (1962)

says that the species is "occasional in meadows and streambeds, Upper Sonoran life zone" in southeastern Washington and adjacent Idaho and in his 1937 work that it is "occasional, meadows and stream banks" in southwestern Washington — in both cases it is undoubtedly var. scabra Moldenke to which reference is being made.

Winter and his associates (1959) state that V. hastata grows in "moist valleys and draws over the state" of South Dakota, Bartley (1959) records it from Jackson County, Ohio, and Tatnall (1946) avers that it is "common in meadows" in the Piedmont and on the Coastal Plain of Delaware and Maryland "as far south as Wicomico Co.", blooming there from "late June through August". Swink (1969) tells us that it is found in "All 22 counties" of the Chicago region and is there "Frequent in marshy ground, associating with Asclepias incarnata, Boehmeria cylindrica, Calamagrostis canadensis, Eupatorium maculatum, Eupatorium perfoliatum, Impatiens capensis, Leersia oryzoides, Lycopus americanus, Lythrum alatum, Penthorum sedoides, Scirpus americanus, Scirpus atrovirens, and Typha latifolia. In moist meadows its associates include Agrostis alba, Aster novae-angliae, Carex vulpinoidea, Geum laciniatum trichocarpum, Helianthus grosseserratus, Phlox glaberrima interior, Pycnanthemum virginianum, Spartina pectinata, and Veronicastrum virginicum." Montgomery (1966) gives its Canadian distribution as "N. S. to B. C.", which agrees with what most authors state. Wunderlin (1966) affirms that it is "local in open ground" in Carroll County, Illinois, and cites his nos. 148 and 208, while Rouleau (1964) tells us that it occurs only in western and central Quebec and Sexsmith (1965) records it from Grosse Ile in that province.

Fischer & Harshberger (1941) describe the flowers of this plant very interestingly: "The individual flowers attempt to be 2-sided like the mints but have never quite succeeded in getting their mouths open". Ward (1967) almost unbelievably reduces V. hastata to synonymy under V. officinalis L.!

Dobbs (1963) reports that V. hastata is "One of the many old time medicinal plants and still said to be of some commercial importance, the herb being used"; Krochmal, Walters, & Doughty (1969) say that in Appalachia the "herbaceous parts [of this plant are] reportedly used as an astringent, antipyretic, vulnerary, antirheumatic, tonic, and expectorant", while Uphof (1968) says "Dried herb, collected at flowering time, used medicinally as expectorant, diaphoretic. Contains verbenalin, a glucoside". Others have reported that the root is used as an emetic, tonic, expectorant, sudorific, and vulnerary, and that it contains irritant properties. Chemists report that the plant contains glucosides, verbenalin, a bitter principle, and tannin. Verbenalloside is reported from it by Cheymol (1937).

Keeler (1917) has found that V. hastata is pollinated by bees and flies and is nectar-bearing. Shinn (1967) found it to be visited regularly by the bee, Calliopsis nebraskensis. Streams and his associates (1968) report that nymphs of the tarnished

plant-bug infest it in Connecticut, as they also do V. urticifolia, Erigeron annuus, E. strigosus, Oenothera biennis, Daucus carota, and species of Solidago, and are there parasitized by the wasp, Leiophron pallipes, forming a biologic control of the bug that would otherwise spread from weeds to cultivated crops.

Hirata (1966) records the powdery mildew, Erysiphe cichoracearum P. DC., infesting V. hastata in Canada and the United States, while Thornberry (1966) records the same fungus and also the following: Phyllosticta verbenicola G. Martin (in New Jersey), Puccinia vilfae Arth. & Holw. (a rust) in South Dakota and from Indiana to Oklahoma, and Septoria verbenae Rob. (a leaf-spot) from Vermont to Mississippi, Texas, and South Dakota.

Savage (1945) tells us that in the Linnean Herbarium, London, sheet 12 under genus 35 is labeled "hastata" in Linnaeus' own handwriting. The "blue vervain" illustrated by Pellett (1931) is surely V. stricta Vent., rather than V. hastata.

Additional common names reported for Verbena hastata, besides those previously recorded by me, are "American blue vervain", "simples joy", "tall vervain", "tall wild verbena", and "verbain".

Material of V. hastata has been misidentified and distributed in some herbaria as V. engelmannii Moldenke, Veronica longifolia L., and Teucrium canadense var. occidentale (A. Gray) McClintock & Epl. On the other hand, the Prater 60 and A. E. Radford 541, distributed as V. hastata, are actually V. bonariensis L.; J. A. Duke 0196 is V. brasiliensis Vell.; Lindzey 253 is V. canadensis (L.) Britton; Cory 50298, Daubermire s.n. [August 1, 1933], Dillon 842, Elmer 532, L. F. Henderson s.n. [June 19, '92], Kreager 469, E. P. Sheldon s.n. [S.11167], Stephens & Brooks 25064, and D. R. Swingle s.n. [July 21, 1933] are V. hastata var. scabra Moldenke; Mahler 861 is V. macdougalii Heller; Drummond s.n. [St. Louis, N. Am.] is xV. moechina Moldenke; Hapeman s.n. [Minden, Aug. 23, 1939] is xV. perriana Moldenke; Bolen 59 is V. pumila Rydb.; B. Martin 86 is V. stricta Vent.; Barkley & Ha'if 4003 is V. supina L.; and H. B. Parks s.n. [June 23, 1946] is V. xutha Lehm. The G. N. Jones 17655, cited below, has its leaves slightly roughened and may possibly be var. scabra.

Additional citations: QUEBEC: Huntingdon Co.: Ernest & LeBlanc 61-200 (Go). ONTARIO: Carleton Co.: Senn 1958 (Id). MAINE: Cumberland Co.: H. N. Moldenke 18898 (Se-184850). NEW HAMPSHIRE: Cheshire Co.: Ottley 5750 (Lk). Merrimack Co.: Barkley & Courtney 405039 (Ac, Go). VERMONT: Chittenden Co.: S. F. Blake 1957 [Herb. Blake 3058] (Id). MASSACHUSETTS: Berkshire Co.: Jones & Jones 17129 (N). NEW YORK: Jefferson Co.: J. I. Northrop s.n. [Thousand Islands, July 16, 1889] (N). Otsego Co.: Collector undetermined s.n. [E. Springfield, 7.76] (N). Seneca Co.: Chickering s.n. [Ovid, July 1857] (W-2605971). NEW JERSEY: Morris Co.:

Moldenke & Moldenke 25633 (Ac, Ft, Rf, Z). Somerset Co.: A. L. Moldenke s.n. [August 2, 1969] (Ps--1019); H. N. Moldenke 8090 (Se--113522). Union Co.: A. L. Moldenke s.n. [Mountainside, Aug. 20, 1968] (Ps--394). PENNSYLVANIA: Huntingdon Co.: H. A. Wahl 1388 (Se). MARYLAND: Montgomery Co.: Killip 36741 (Au--122289). DISTRICT OF COLUMBIA: Sudworth 605 (Mi), s.n. [22 June 1890] (Mi). WEST VIRGINIA: Preston Co.: Davis & Davis 8974 (Se--127868). OHIO: Butler Co.: J. Ferguson s.n. [July 19, 1932] (Go). ILLINOIS: Champaign Co.: R. A. Conover s.n. [August 7, 1946] (N). Cook Co.: H. R. Bennett s.n. [August 24, 1957] (Se--178943). McHenry Co.: H. R. Bennett s.n. [August 31, 1957] (Se--180360). Tazewell Co.: V. H. Chase 3229 (Se--201149). INDIANA: Greene Co.: Friesner 22294 (Au--122284). Pulaski Co.: Friesner 9768 (Sd--31744). IOWA: Allamakee Co.: Snead s.n. [August 12, 1946] (Au--122285). KENTUCKY: Bath Co.: M. E. Wharton 3226 (Mi). Estill Co.: M. E. Wharton 3015 (Mi). Jefferson Co.: Gunn 2020 [South. App. Bot. Club 19: 1831] (W--2433751). Lewis Co.: M. E. Wharton 5086 (Mi). Madison Co.: M. E. Wharton 5633b (Mi). MICHIGAN: Branch Co.: C. A. Brown 2605 (N). St. Joseph Co.: H. R. Bennett 2707 (W--2445852). WISCONSIN: Dane Co.: G. N. Jones 17655 (N). Dodge Co.: Preston 19 (Ws). Grant Co.: Beetham s.n. [Sept. 19, 1966] (Ws). Manitowoc Co.: Demler 30 (Ws). Rock Co.: P. J. Scott s.n. [9-17-66] (Ws). MINNESOTA: Martin Co.: Bartlett & Grayson 1382 (N). Murray Co.: Jensen-Haarup s.n. [Slayton, summer 1913] (Ac). Ramsey Co.: S. F. Elake 161 [Herb. Blake 1200] (Id). KANSAS: Reno Co.: Poindexter 195-14 (N). MISSOURI: Clark Co.: J. A. Steyermark 68918 (N). St. Louis: Muehlenbach 3695 (Ac). NEBRASKA: Dundey Co.: Richardson & Robertson 1256 (N). OKLAHOMA: Harper Co.: Stratton 3368 (Lk). TEXAS: Hemphill Co.: Cumbie 89 (Lk); E. L. Reed 4034 (Lk); C. M. Rowell 10596 (Lk). Oldham Co.: York & Rodgers 363 (Lk). LOCALITY OF COLLECTION UNDETERMINED: Herb. A. Brown s.n. (N).

VERBENA HASTATA f. ALBIFLORA Moldenke

Additional bibliography: Hausman, Begin. Guide Wild Fls. 303. 1948; Moldenke, Phytologia 16: 91. 1968; Moldenke, Fifth Summ. 1: 16--18, 37, 40, & 45 (1971) and 2: 650, 673, & 915. 1971.

VERBENA HASTATA f. CAERULEA Moldenke

Synonymy: Verbena americana, spici multiplici, foliis urticae angustissimis, floribus caeruleis Tourn., Compl. Herb. 358. 1719.

Bibliography: Tourn., Compl. Herb. 358. 1719; Hocking, Excerpt. Bot. A.9: 290. 1965; Moldenke, Phytologia 13: 200. 1966; Moldenke, Fifth Summ. 1: 15 (1971) and 2: 649--651 & 915. 1971.

Many authors have spoken of the corollas of Verbena hastata L. as being "blue", and the standard common name for the species is

"Blue Vervain". In reality, the corollas of the typical and widespread form of the species are violet-purple, but usually appear as blue to persons who are more or less colorblind to red. It is not certain how widely the truly blue color-form of the species is distributed since only the reports of definitely non-colorblind observers can be relied on in this matter.

VERBENA HASTATA f. ROSEA Cheney

Additional bibliography: Graves, Eames, Bissell, Andrews, Harger, & Weatherby, Bull. Conn. Geol. & Nat. Hist. Surv. 14: [Cat. Flow. Pl. Conn.] 331. 1910; Harger, Bull. Conn. Geol. & Nat. Hist. Surv. 48: 74. 1930; Hausman, Begin. Guide Wild Fls. 303. 1948; Dobbs, Fl. Henry Co. 230. 1963; Moldenke, Phytologia 14: 285. 1967; F. C. Seymour, Fl. New Engl. 456. 1969; Ownbey & Monserud, Common Wild Fls. Minn. 312. 1971; Moldenke, Fifth Summ. 1: 15--19, 22, 35, 37, 40, 43, & 45 (1971) and 2: 673 & 915. 1971.

Dobbs (1963) records this form from "low moist south border of Shadow Lake", Henry County, Illinois. Ownbey & Monserud (1971) record it from Minnesota, but, unfortunately, do not give a precise locality.

VERBENA HASTATA var. SCABRA Moldenke

Synonymy: Verbena hastata scabra Moldenke ex Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. Bot. 6:] 1876. 1970.

Additional bibliography: Moldenke, Phytologia 16: 91. 1968; Munz, Suppl. Calif. Fl. 101. 1968; Moldenke in Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. Bot. 6:] 1314 & 1319. 1970; Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. Bot. 6:] 1876. 1970; Moldenke, Fifth Summ. 1: 15, 40--43, 50, 52, 59, 62, 64, & 65 (1971) and 2: 674, 793, & 915. 1971.

Recent collectors have found this variety growing in wet meadows, on sandhill prairies, and in roadside ditches, flowering and fruiting in September and October. Crampton describes it as a perennial; Cory calls it "abundant in moist floodplain of river", growing to 18 dm. tall, while Andrew & Alison Moldenke refer to it as a "weed in horse pasture, sympatric, no hybrids". The only recorded common name for it is "blue vervain" and it has hitherto been misidentified as typical V. hastata L.; in fact, the Dillon 842, L. F. Henderson s.n. [June 19, '92], Kraeger 469, E. P. Sheldon S.11167, and D. R. Swingle s.n. [July 21, 1933], cited below, were previously reported by me as typical V. hastata before I recognized the validity of the variety. It is very probable that most, if not all, of the far western collections previously cited by me under V. hastata will prove to represent this variety. Munz (1968) describes the variety as "Lf.-bases more rigid; lvs. conspicuously scabrous on upper surface, often ± conspicuously pubescent beneath. - Cited from Modoc, San Joaquin and Shasta cos.; to B. C., Mont."

Additional & emended citations: MANITOBA: Fisher Distr.: J. M.

Macoun s.n. [July 30th, 1884] (Pa). MINNESOTA: Hennepin Co.: Daubenmire s.n. [August 1, 1933] (Se--177625). MONTANA: Gallatin Co.: D. R. Swingle s.n. [July 21, 1933] (Se--26665). Ravalli Co.: Hitchcock & Muhlick 21937 (Se--196402). NEBRASKA: Logan Co.: Stephens & Brooks 25064 (N). TEXAS: Hemphill Co.: Cory 50298 (Mi). WASHINGTON: Grant Co.: T. H. Scheffer s.n. [July 31, 1945] (Se--102238). Okanogan Co.: Dillon 842 (Se--94450); Elmer 537 (Vt). Skamania Co.: Suksdorf 10572 (Se--118381). Stevens Co.: Kreager 469 (Se--68697). Yakima Co.: L. F. Henderson s.n. [June 19, '92] (Se--11943); Kruckeberg 2545 (Se--181162); Moldenke & Moldenke 3123 (Rf, Z). OREGON: Multnomah Co.: Gilkey s.n. [Portland, July 31, 1935] (Au--122290, Se--131497); E. P. Sheldon S. 11167 (Se--104920). CALIFORNIA: San Joaquin Co.: Crampton 3149 (Ca--1278077).

VERBENA HATSCHBACHI Moldenke

Additional bibliography: Angely, Fl. Anal. Paran., ed. 1, 571. 1965; Moldenke, Phytologia 13: 249. 1966; Moldenke, Fifth Summ. 1: 177 (1971) and 2: 674 & 915. 1971.

VERBENA HAYEKII Moldenke

Additional bibliography: J. F. Macbr., Field Mus. Publ. Bot. 13 (5): 614. 1960; Moldenke, Phytologia 13: 249. 1966; Moldenke, Résumé Suppl. 17: 3. 1968; Moldenke, Fifth Summ. 1: 143 (1971) and 2: 691 & 915. 1971; Moldenke, Phytologia 23: 185. 1972.

Vargas Calderón describes this plant as "prostrate", while Hodge refers to it as a "creeping roadside plant, flowers blue-purple". It has been collected in fruit in December (in addition to the months previously reported by me) and material has been misidentified and distributed in herbaria under the name V. polystachya H.B.K.

Additional citations: PERU: Apurimac: Vargas Calderón 8712 (Ac). Cuzco: Vargas Calderón 20066 (Ac). Junín: Hodge 6237 (W--2612023); S. G. E. Saunders 696 (N). Lima: López Guillén 3318 (Rf).

VERBENA HERTERI Moldenke

Additional synonymy: Verbena herteri "Moldenke ex Herter" a-pud Hocking, Excerpt. Bot. A.8: 226. 1965.

Additional bibliography: Moldenke, Phytologia 16: 91. 1968; Moldenke, Fifth Summ. 1: 177 & 189 (1971) and 2: 674 & 915. 1971.

VERBENA HIRTA Spreng.

Additional bibliography: Barroso, Rodriguésia 32: 70. 1957; Angely, Fl. Anal. Paran., ed. 1, 571. 1965; Dombrowski & Kuniyoshi, Araucariana 1: 14. 1967; Moldenke, Phytologia 16: 91, 199, & 205. 1968; Angely, Fl. Anal. Fitogeogr. Est. S. Paulo, ed. 1, 4: 839, map 1392. 1970; Moldenke, Fifth Summ. 1: 177, 201, & 370 (1971) and 2: 690 & 915. 1971.

According to Hatschbach this species grows from a xylopodium. Its corollas are described as "lilac" on Hatschbach 14781 & 22487 and Hatschbach & Guimarães 18439. Barroso (1957) cites Brade 15664, Burret & Brade 16042, Occhioni s.n. [Abril de 1921], and "RB" 16458, 22564, 32898, & 35233, giving the geographic distribution of the species as São Paulo, Minas Gerais, and Rio de Janeiro. Actually it is also found in Bahia, Paraná, Rio Grande do Sul, and Santa Catarina, Brazil, as well as in Misiones, Argentina, and cultivated in Germany.

Additional citations: BRAZIL: Paraná: Angely 3579 (Ca--1276799); Hatschbach 14781 (W--2564728), 22487 (Mi); Hatschbach & Guimarães 18439 (Ac); Hatschbach & Haas 15669 (Rf); Reitz & Klein 17484 (N, W--2548331). Rio de Janeiro: Pabst 9317 [Herb. Brade 42402] (Ac). Santa Catarina: Smith & Klein 13885 (N).

VERBENA HIRTA var. GRACILIS Dusén

Additional bibliography: Angely, Fl. Anal. Paran., ed. 1, 571. 1965; Moldenke, Phytologia 16: 91 & 205. 1968; Moldenke, Fifth Summ. 1: 177 (1971) and 2: 915. 1971.

Additional citations: BRAZIL: Paraná: Reitz & Klein 17616 (N, W--2548333), 17883 (W--2548332).

VERBENA HISPIDA Ruiz & Pav.

Additional & emended bibliography: Pers., Sp. Pl. 3: 347. 1819; Steud., Nom. Bot. Phan., ed. 1, 873. 1821; Reiche & Phil., Fl. Chil. 5: 283 & 284. 1910; Noack, Biol. Zentralbl. 57: 384 & 386, fig. 9. 1937; Cheymol, Bull. Soc. Chim. Biol. 19: 1647--1653. 1937; Anon., Chem. Abstr. 32: 2977. 1938; J. F. Macbr., Field Mus. Publ. Bot. 13 (5): 613, 615, & 622. 1960; Padmanabhan, Phytomorph. 14: 449. 1964; Meyer & Weyrauch, Inst. Mig. Lill. Misc. 23: 64 & 123. 1966; Alzate, Pl. Medic., ed. 7, 264--265. 1968; Kunkel, Willdenovia 4: 351. 1968; Moldenke, Phytologia 16: 91--92. 1968; Moldenke, Résumé Suppl. 16: 7. 1968; Farnsworth, Bloomster, Quimby, & Schermerh., Lynn Index 6: 267. 1969; Bolkh., Grif, Matvej., & Zakhar., Chrom. Numb. Flow. Pl. 717. 1969; Angely, Fl. Anal. Fitogeogr. Est. S. Paulo, ed. 1, 4: 839. 1970; Moldenke, Fifth Summ. 1: 137, 143, 177, 184, 187, 193, 201, 203, 205, 206, & 370 (1971) and 2: 655, 665, 671, 673, 674, 679, 680, 686, 695, 702, 705, & 915. 1971.

Additional illustrations: Noack, Biol. Zentralbl. 57: 386, fig. 9. 1937.

Recent collectors have found this plant growing in the beds of dry brooks, fruiting (in addition to the months previously reported by me) in January and February. The corollas are described as "lilac" on Luna 382 & 453 and Terribile 238. The Cabrera (1957) reference in the bibliography of this species is sometimes cited as "1958".

Alzate (1968) affirms that this species can be used as a substitute for V. officinalis L. (which see) in New World medicine. Cheymol (1937) reports the isolation of stachyose from this plant.

Kunkel (1968) informs us that the so-called V. hispida Ruiz & Pav. of Reiche in Anal. Mus. Nac. Chile (1903) is actually V. litoralis H.B.K. Macbride (1960) cites the following Peruvian collections: Arequipa: Isern 165. Cajamarca: Raimondi s.n. [Cascas]. Cuzco: Herrera s.n. [Prov. de Cercado], Hicken s.n. [Sicuani], Pennell 14184, Soukup 259. Huancavelica: Stork & Horton 10820. Huánuco: Macbride 1704, Ruiz & Pavon s.n. [near Huánuco]. Junín: Killip & Smith 21855 & 21925, Macbride 1006. Lima: Raimondi s.n. [near Lima], Pennell 14582. Moquegua: Isern 166. Puno: Pennell 13409. He gives "Ecuador, Chile and Argentina" as the extra-Peruvian distribution, but, of course, it occurs also in Brazil, Paraguay, and Bolivia, is naturalized in Germany and Switzerland, and is widely distributed elsewhere in cultivation.

Material of V. hispida has been misidentified and distributed in some herbaria as Junellia sp. On the other hand, the Hodge 6237, distributed as V. hispida, is actually V. hayekii Moldenke.

Additional citations: ECUADOR: Azuay: Asplund 17805 (N). PERU: Apurímac: Vargas Calderón 8881 (Ac). Arequipa: Vargas Calderón 19426 (Ac), 19530 (Ac). Cuzco: Vargas Calderón 12722 (W--2520259), 13902 (Ac). Moquegua: Vargas Calderón 17985 (Ac). Puno: Ugent & Ugent 4543 (W--2558165). BOLIVIA: Cochabamba: R. F. Steinbach 84 (W--2533070). CHILE: Tarapacá: Zöllner 4401 (Ac). ARGENTINA: Catamarca: Luna Risso 875 (N), s.n. [11-I-1947] (N); A. Reales 1039 (N). Chaco: Buratovich 577 (N), 752 (N). Formosa: I. Morel 2908 (N), 3476 (N), 3893 (N), 4102 (N), 4394 (N), 6331 (N), 6392 (N). Jujuy: A. Reales 615 (N). Mendoza: Semper s.n. [7/V/44] (N). Salta: Luna 382 (N), 453 (N). Santiago del Estero: Balegno 96 (N); Luna 257 (N). Tucumán: A. Reales 891 (N, Rf); Terribile 238 (N).

VERBENA HOOKERIANA (Covas & Schnack) Moldenke

Additional & emended bibliography: J. A. Clark, Card Ind. Gen. Sp. Var. issue 191. 1945; Darlington & Wylie, Chrom. Atl., pr. 1, 323 (1956) and pr. 2, 323. 1961; Ruiz Leal, Revist. Facult. Cienc. Agrar. Mendoza 11: 173 & 174, fig. 8. 1964; Troncoso in Cabrera, Fl. Prov. Buenos Aires 5: 133 & 137. 1965; Moldenke, Phytologia 16: 92. 1968; Ruiz Leal, Biol. Abstr. 49: 3256. 1968; Bolkh., Grif, Matvej., & Zakhar., Chrom. Numb. Flow. Pl. 715 & 717. 1969; Moldenke, Fifth Summ. 1: 201 (1971) and 2: 521, 664, & 915. 1971; Moldenke, Phytologia 23: 195. 1972.

Additional illustrations: Ruiz Leal, Revist. Facult. Cienc. Agrar. Mendoza 11: 174, fig. 8. 1964.

Bartlett found this plant growing "in flat Larrea cuneifolia association, loess soil" in Catamarca, Argentina. It has been collected in fruit in December (in addition to the months previously reported by me). The corollas are described as having been "yellow" on P. Garcia 927, but this was probably a mistake in ob-

servation or transcription. Troncoso (1965) states that they are normally violet in color. She gives the distribution of the species as "Regiones secas y áridas del centro y oeste del país [Argentina], extendiéndose hasta el extremo más austral de las provincias fitogeográficas del Monte y Espinal", citing Bartlett 19918 (at San Isidro) and J. F. Molino s.n. (at Buenos Aires), and commenting that "Todas las citas de V. crithmifolia Gill. et Hook. dadas para el Provincia [Buenos Aires] deben referirse a esta especie". Material has been widely misidentified and distributed in herbaria, as she says, as V. crithmifolia.

Additional citations: ARGENTINA: Buenos Aires: Eyerdam, Beetle, & Grondona 23443 (Se—119015). Catamarca: H. H. Bartlett 20231 (N); Brizuela 404 (Se—130303), 614 (N), 1014 (N), 1064 (N); O' Donell & Meyer 5155 (N), 5220 (N). Córdoba: Balegno 345 (N); H. H. Bartlett 20149 (N); Sota 317 (N), 407 (N), 443 (N). La Rioja: M. P. Gomez s.n. [Herb. Inst. Miguel Lillo 106844] (N). Mendoza: Krapovickas & Cristóbal 14624 (Z). Río Negro: O'Donell 1693 (N), 1749 (N). San Luis: Varela 547 (N), 624 (N), 653 (N), 732 (N). Santiago del Estero: Balegno 210 (N, S); P. Garcia 927 (N).

VERBENA HUMIFUSA Cham.

Additional bibliography: Angely, Fl. Anal. Paran., ed. 1, 571. 1965; Moldenke, Phytologia 16: 92 & 100. 1968; Moldenke, Fifth Summ. 1: 177, 187, & 190 (1971) and 2: 662, 675, 692, 693, & 915. 1971.

Additional citations: PARAGUAY: Hassler 9479 (Ca—950564).

xVERBENA HYBRIDA Voss

Additional synonymy: xVerbena hybrida "Voss ex Rümpler" apud Hocking, Excerpt. Bot. A.8: 226. 1965.

Additional & emended bibliography: E. Twining, Ill. Nat. Ord. Pl. 2: 104, fig. 2. 1855; Paque, Fl. Anal. & Descr. Prov. Namur & Luxemb. 447. 1902; Blakeslee, Science, new ser., 48: 298--299. 1918; Tischler, Tabul. Biol. 4: 24. 1927; Gough, Gard. Book Malaya 248. 1928; Navarro de Haydon, Flor. Comun. Puerto Rico [16]. 1936; Noack, Biol. Zentralbl. 57: [383]—387, fig. 14. 1937; Scott-Moncrieff & Sturgess, Chem. Abstr. 34: 4419. 1940; Furusato, Bot. & Zool. Theoret. & Appl. [Syokobutu Oyobi Dobutu] 8: [1303]—1311 (39—47). 1940; Fischer & Harshberger, Flower Fam. Alb. 87. 1941; E. L. D. Seymour, New Gard. Encycl., ed. 3, 1279 (1944) and ed. 4, 1279. 1946; Blank, Bot. Rev. 13: 260, 287, & 288. 1947; E. L. Palmer, Fieldbook Nat. Hist., ed. 1, pr. 3, 297 & 663. 1949; E. L. D. Seymour, New Gard. Encycl., ed. 5, 1279. 1951; Bodger, Libr. Hort. Illustr. Electros of Fls. 27, 61, 95, & 105, pl. 54g, 441e, 573c, 956a, 1137f, & 3018f. 1952; Geissman & Hinreiner, Bot. Rev. 18: 133. 1952; Mauser, Samen [Zürich] 1953: 1, fig. 8053. 1953; Kuck & Tongg, Mod. Trop. Gard. 213. 1955; Thomas & Hendricks in Magill, Holden, & Ackley, Air Pollution Handb. 9: 1—44. 1956; Darlington & Wylie, Chrom. Atl., pr.

1, 323. 1956; Ledbetter, Zimmerm., & Hitchc., Contrib. Boyce Thomp. Inst. 20: 275 & 277. 1959; Withamfogg in Kiaer & Hancke, Gard. Fls. in Colour, pr. 1, 127 & 190, fig. 487--489 & 491. 1959; Howell & McClintock in Kearney & Peebles, Ariz. Fl., ed. 2, 724. 1960; Buia, Fl. Mic. Illustr. Rep. Pop. Rom. [50] & 401, pl. 16. 1961; Darlington & Wylie, Chrom. Atl., pr. 2, 323. 1961; Haramaki, Proc. 17th Northeast. Weed Control Conf. 213--217. 1963; S. R. & R. S. Fujimoto, U. S. Pl. Patent 2271. 1963; E. L. D. Seymour, New Gard. Encycl., ed. 6, 1279, pl. 59 (1963) and ed. 7, 1279, pl. 59. 1964; Anon., Hortic. Abstr. 34: 732. 1964; Bardi, Trop. Gard. Burle Marx 123, pl. 177. 1964; Buckley & Cavaye, Greenhouse Gard. Grass 4: 20. 1964; Radford, Ahles, & Bell, Guide Vasc. Fl. Carol. 281 & 282. 1964; Fugii, U. S. Pl. Patent 2404 (1964) and 2537. 1965; Anon., Hortic. Abstr. 35: 518. 1965; J. & L. Bush-Brown, Am. Gard. Book, ed. 4, 315, 327, & 671. 1965; Haramaki, Weed Abstr. 14: 256. 1965; Heimans, Heinsius, & Thijsee, Geillustr. Fl. Nederl. 908. 1965; Mitchell & Knight, Journ. Exper. Biol. 16: 11. 1965; Ohwi, Fl. Jap. 763. 1965; Stefan, Babes, & Juga, Lucr. Sti. Stat. Exp. Dobregea, Vol. Omag. 1944-1964, 265--275. 1965; Yotaro, Gard. Pl. World 1: 131, pl. 66, fig. 1. 1965; Altman & Dittmer, Environ. Biol. 316, 624, & 641. 1966; Anon., Hortic. Abstr. 36: 582. 1966; J. G. Barton in Novác, Pict. Encycl. Pl. & Fls. 403 & 405, fig. 801. 1966; Burkill, Dict. Econ. Prod. Malay Penins. 2: 2266. 1966; T. H. Everett, Reader's Digest Compl. Book Gard. 113, 153, 553, & 569. 1966; Greensill, Trop. Gardening 79, 98, & 242. 1966; Hirata, Host Range & Geogr. Distrib. Powd. Mild. 276--277. 1966; Mishra, Sci. & Cult. 32: 199--201. 1966; Thornberry, U. S. Dept. Agr. Agric. Handb. 165: 479. 1966; G. Abraham, Green Thumb Book 195 & 220. 1967; Anon., Hortic. Abstr. 37: 174. 1967; Arora & Khoshoo, Indian Journ. Genet. & Pl. Breed. 27: 275--277. 1967; Coon, Fragrance & Frag. Pl. 142. 1967; H. C. D. de Wit, Pl. World High. Pl. 2: 183. 1967; G. W. Kelly, Rocky Mtn. Hort., ed. 2, 125--127, 118, & 223. 1967; L. & M. Milne, Living Pl. World 212. 1967; Tingle, Check List Hong Kong Pl. 38. 1967; Zukowski in Pawlowskiego, Fl. Polsk. 11: 65. 1967; Anon., Hortic. Abstr. 38: 779 & 1037. 1968; Anon., Deutsch. Gärtnerbörse 68: 72--78. 1968; Faroy Inc. Houston Tex. Card 25--89. 1968; Hartmann & Kester, Pl. Prop., ed. 2, 683. 1968; Horodysky, Diss. Abstr. 28: 4937. 1968; Horodysky, Bioresearch Ind. 4: 5682. 1968; Laurie, Kiplinger, & Nelson, Commercial Flow. Forcing 483. 1968; Moldenke, Phytologia 16: 187--188, 193, & 195. 1968; Moldenke, Résumé Suppl. 16: 6, 7, 13, & 28 (1968) and 17: 3 & 7. 1968; A. L. Moldenke, Phytologia 16: 455. 1968; A. & I. Nehrling, Easy Gard. Drought-resist. Pl. 254. 1968; Roos, Natl. Geogr. 133: 726 & 732. 1968; Stucchi, Fiori 11: 131. 1968; Verbena Snow White, Northrop King Seeds 526. 1968; R. Webber, Early Horticult. 133 & 208. 1968; Withamfogg in Kiaer & Hancke, Gard. Fls. in Colour, pr. 5, 127 & 190, fig. 487--489 & 491. 1968; Bolkh., Grif, Matvej., & Zakhar., Chrom. Numb. Flow. Pl. 717. 1969; Farnsworth, Blomster, Quimby, & Schermerh., Lynn Index 6: 267. 1969; Fior, Nostr. Fl., ed. 3, 570. 1969; Hay & Synge, Dict. Gard. Pl. 49 & 369, pl. 392. 1969; Liogier, Fl. Cub. Supl. 123. 1969; Shumway, Ann. Cat.

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The Tischler (1927) reference in the bibliography above is cited by Bolkhovskikh and his associates (1969) as "Tischler,

Pflanzl. Chrom....."

Pennington tells us that in Chihuahua, Mexico, this entire plant is decocted into a potion taken for "dolor del estómago" (stomache-ache). Blank (1947) reports that investigations have shown that pelargonidin derivatives are sometimes dominant and sometimes recessive to delphinidin derivatives in this plant; also, monosides are sometimes dominant and sometimes recessive to dimonosides. Mixtures of anthocyanins occur due to incomplete dominance or to modifying factors. Geissman & Hinreiner (1952) report the presence in this plant of a naturally-occurring anthocyanin called delphin, which is a 3,5-diglucoside of delphinidin. Farnsworth and his associates (1969) record the isolation by Scott-Moncrieff & Sturgess (1940) of delphinidin-3,5-diglycoside, delphinidin-3-monoglycoside, and glucose in the flowers of xV. hybrida. Ledbetter and his associates (1959) report that "Ver-bena sp. var. L. A." is one of 32 species and varieties of plants susceptible on exposure to ozone at concentrations of 0.1 to 1.0 ppm. in a circulating stream of washed air. Very young leaves with no functional stomata were resistant to ozone, but others spotted necrotically.

Thornberry (1966) and Westcott (1971) record the following disease-causing organisms as attacking this plant: Botrytis cinerea Pers. (a flower blight, in Massachusetts), Erysiphe cichoracearum P. DC. (a powdery mildew, general), Macrophomina phaseoli (a charcoal rot, Oklahoma), Phymatotrichum omnivorum (Shear) Dug. (a root rot, Texas), Rhizoctonia solani Kuehn (a root rot, New York), Thielaviopsis basicola (a root rot, Pennsylvania), Meloidogyne sp. (a root rot nematode, Maryland), Sclerotium bataticola Taub. (a charcoal stem rot, Oklahoma), Sphaerotheca humuli (P.DC.) Burr. (a powdery mildew, Puerto Rico), and Heterodera marioni (Cornu) Goodey (a root knot nematode, Maryland).

According to Hirata (1966) the following fungi attack xV. hybrida: Erysiphe cichoracearum (in Australia, Bermuda, Sweden, and United States), E. polyphaga (in France, Germany, Italy, and Switzerland), Sphaerotheca fuliginea and S. verbenae (in Armenia, Australia, Italy, Japan, Lithuania, Puerto Rico, Romania, and United States), Microsphaera ferruginea (in Italy and Sweden), and Oidium verbenae (in Argentina, Australia, Egypt, New Zealand, Portugal, Rhodesia, South Africa, Switzerland, Tasmania, and United States), all powdery mildews.

The Bush-Browns (1965) add the oblique-banded leaf-roller to the known pests of this plant. This is a small caterpillar, banded with yellow and light-green, feeding on the foliage and flowers, rolling and webbing the leaves with silken threads. The female moth deposits her eggs in tiny masses on the foliage, where they hatch in a few weeks. The larvae are full-grown in one month, pupate within the rolled leaves, and emerge as adults several weeks later. There are normally two broods per season. Kelly (1967) reports that a blister beetle constitutes a pest of this

plant in the Rocky Mountain region.

The Nehrlings (1968) list this among their annual drought-resistant plants. Laurie, Kiplinger, & Belson (1968) aver that verbenas of this type can be sown in early March for spring sale by dealers, but better plants with more flowers can be produced by sowing the seed in early February and carrying the plants at 53° F. Picking will make compact bushy plants of the taller grandiflora types, although natural dwarf varieties are available. Tingle (1967) reports it as being cultivated in Hongkong. Thornberry (1966) notes that it is "widely grown for ornament as a summer annual in the North [of the United States] and as a winter annual in the South."

According to Mishra (1967) terminal shoot-tips of this plant were treated experimentally with colchicine at concentrations of up to 0.1 percent for 4, 8, and 16 hours. All the treated seedlings survived, although growth was temporarily retarded. They later became taller than control seedlings, had 12--23 branches as compared to only 5--8 on the controls, and produced larger and more serrated leaves. Stomatal size increased considerably in the treated plants with a corresponding decrease in number per unit of leaf-surface and the pollen-grains were significantly larger with a high sterility percentage. The treated plants remained vegetative longer, but the flowering period was also more prolonged than in the controls.

Coon (1967) notes that "The flowers are not noted for fragrance, yet there's a special kind of quiet, haunting odor to verbenas which you'll not get to know unless you grow them." Burkill (1966) says that "V. hybrida does not fruit in Malaysia, as the climate is too moist. The presumed parents are perennial, but V. hybrida must be grown as an annual from imported seed, and.....is impatient of damp and not always a success in wet weather." Ohwi (1965) records it as cultivated in Japan. Radford, Ahles, & Bell (1964) affirm that the plant is commonly cultivated in the Carolinas and rarely escaped along roadsides and in sandy alluvium in Darlington and Kershaw Counties, South Carolina, flowering there from late March to May.

Webber (1968) informs us that verbenas were introduced into England from South America in the mid-eighteenth century and then used mainly as bedding plants. Stucchi (1968) adds that the hybrid was first introduced into Italy between 1829 and 1839. Kuck & Tongg (1955) reiterate that it is very difficult to grow in tropical gardens. It has apparently escaped from cultivation and become naturalized in Paraná, Brazil, where it is now found in "Locaes umidos de varzea", according to Hatschbach. The corollas on these naturalized specimens are "violet" [Hatschbach 14769] or "rosa avermelhada" [Manfrin 4]. In Honduras the naturalized plants have "rose-red" corollas [Molina R. 14708].

Culture directions given by Northrup King (1968) are "use: cut flower, low bedding and border. Where to plant: any garden soil under full sunlight. When & how to plant: indoors: For earliest flowering, start seeds in flats, peat pots or boxes in

early spring. Cover seed 1/8 inch deep, pressing firmly into soil. Keep moist and in sunny window. When seedling [is] 2 inches tall, thin or transplant. When weather [is] warm, transplant into garden spacing about 1 foot apart. Water well and protect from sun a few days. Outdoors: Seed can be sown as soon as weather [is] warm outdoors covering about 1/4 inch deep. Firm soil well over seeds. Later thin plants to 1 foot apart....germination [is] slow on Verbena, usually 3--4 weeks so allow ample time for sprouts to appear." Park (1971) calls the plants "Deliciously fragrant - Always in bloom. Brilliantly colored blooms, fine plants for beds, borders, edgings and cuttings. Seed started outside in May will bloom from midsummer until frost; started early inside, June until frost. Fine for covering the bare spot left by early spring bulbs or ground cover among summer or fall bulbs. Easily grown." Priszter (1971) offers seed as his no. 1669.

The following horticultural strains of xV. hybrida are listed in recent horticultural literature and are recorded here because they are either new or their descriptions differ somewhat from the descriptions previously recorded by me:

Amethyst (Park) -- "that lovely sought-after mid-blue, very dwarf 8--12-inch compact plants", Sparkle type; (Burpee) -- "a dwarf Sparkle of low cushionlike plants covered with lavender-blue fls. ideal for low-growing edges, borders, and beds."

Blaze (Hay & Synge) -- dwarf, 9-inch plants, with brilliant scarlet flowers; (P) All-American Selection winner, with large, bold, bright, solid, scarlet flower-heads 3 inches across; (Burpee) -- "a Dwarf Sparkle of dazzling bright scarlet color".

Bush Type Mixed (Park) -- broad flat-topped bushy plants 8--10 inches tall, 12--15 inches across, flower-heads almost touching each other entirely covering the plant.

Candidissima (Withamfogg) -- a dwarf hybrid, 10 inches tall, with white flowers.

Chiquita -- this is V. tenera var. maonetti Regel, which see.

Compliment (Park) -- Bush type, with salmon-orange flowers, each with a yellow eye.

Crystal (Park) -- Sparkle type, with white flowers.

Dannebrog (Withamfogg) -- plants 10--16 inches tall, blooming early, the flowers light-red with white centers.

Dazzle (Park) -- Sparkle type, with red flowers.

Defiance -- see under xV. corrupta Moldenke.

Delight (Park) -- Sparkle type, with coral flowers.

Dwarf Sparkle -- free-blooming compact spreading strain forming a floral carpet all season, 6 inches tall (Burpee).

Firefly (Greensill) -- bright scarlet flowers, meritorious, seed not easy to harvest, shake seed-heads into a bag daily when the sun is hottest.

Firelight (Mauser, Park) -- Bush type, with red flowers.

Giant Salmon Queen (Mauser) -- with salmon-red flowers.

- Ideal Florist Mixture (Park)** -- early flowering plants weaving a carpet of color in summer gardens, only 8 inches tall but spreading to 18 inches across the ground, "the plants clothe themselves in a dazzling array of colors ranging from white to scarlet and pink to purple, each with a dash of white in the center".
- Madame Du Barry (Park)** -- "an entirely new color in verbenas, brilliant purplish-red", vigorous plants 10 inches tall, "large umbels on strong stems, free-branching but distinctly compact in habit, good for bedding and cutting".
- Mammoth Royal Bouquet (Hay & Synge)** -- colorful mixed strain with white Auricula eye, plants 12 inches tall.
- Multiflora Gigantea (Burpee)** -- free-blooming bush type bearing large trusses of big flowers 10 inches tall. "Finest Mixed" colors include rose-pink, lavender, blue, white, violet, salmon-pink, scarlet, and red shades, many "eyed". Burpee No. 4345.
- Rainbow Mixed (Hay & Synge)** -- compact, 9 inches tall, very early flowering.
- Roselight (Mauser, Park)** -- Bush type, rose-colored flowers.
- Royal Blue (Withamfogg)** -- 18 inches tall, with deep purple-blue flowers.
- Royal Carpet (Fugii)** -- see Plant Patent description.
- Ruffled Pink (Burpee)** -- a lovely deep salmon-pink with neat clusters of ruffled flowers and handsome deep-green foliage; the colorful plants are ideal for edgings, beds, ground covers, rock gardens and window-boxes, thriving even in poor soil.
- Salmon Queen (Park)** -- Bush type, with salmon-pink flowers.
- Snow Carpet (Fugii)** -- see Plant Patent description.
- Snow White (Mauser, Northrup, Park)** -- Bush type, with compact clusters of fragrant flowers on attractive compact plants, pure glistening white flowers, plants 1 foot tall.
- Sparkle (Park)** -- with scarlet flowers.
- Sparkle Mixed (Hay & Synge, Park)** -- dwarf, compact, mound-shaped plants, 6--10 inches tall, free-flowering and completely covered with bloom (no open spots), the full color mixture includes warm scarlet through rose and pink to softer salmon, lavender, and white, mid-blue, purple, and bright combinations.
- Splendor (Park)** -- Sparkle type, with royal purple flowers with a clear white eye.
- Verbena Candycane (Fujimoto)** -- see Plant Patent description.
- Verbena Grandiflora Brightness (Bodger).**
- Verbena Grandiflora Mixed (Bodger).**
- Verbena Grandiflora Royale (Bodger).**
- Verbena Hybrida Compacta Leuchtfunk (Mauser).**

To record the selling retail price of verbena seeds in 1972, it may be mentioned here that the prices charged by Burpee (1972) for "Ruffled Pink" may be taken as typical: "No. 3660 pkt. 75 cents; 1/16 oz. \$2.25; 1/8 oz. \$4.25; 1/4 oz. \$8.00."

An additional vernacular name for these plants is "tuinverbena"

in Dutch-speaking countries. The plant has been cultivated at 2800 feet altitude in Mexico. Material has been misidentified and distributed in some herbaria under the names V. chamaedrifolia Juss., V. delticola Small, and V. teucრიoides Gill. & Hook.

Additional citations: MEXICO: Chihuahua: Pennington 27 (Au--264116). PERU: Lima: Camona 1590 (Rf). VENEZUELA: Mérida: López-Palacios 2212 (Z). BRAZIL: Paraná: Hatschbach 14769 (W--2564569); Manfrin 4 [Herb. Fac. Farmacia 5861] (W--2527749). CULTIVATED: Honduras: Molina R. 14708 (N). New Jersey: A. L. Moldenke s.n. [July 9, 1968] (Ps--121). New Zealand: W. R. Sykes 1046/64 (Nz--153295). Pennsylvania: H. N. Moldenke 14979 (Se--135328). MOUNTED ILLUSTRATIONS: fig. 2761 [in color] (Z); Burpee fig. 2793 [in color] (Z); Vaughan Seed Cat. fig. 5715, 5716, & 5725 [in color] (Z).

xVERBENA ILLICITA Moldenke

Additional & emended bibliography: J. D. Poindexter, Trans. Kans. Acad. Sci. 65: 409, 410, 415, 417, & 418. 1962; Moldenke, Phytologia 16: 94. 1968; Swink, Pl. Chicago Reg. 428. 1969; Moldenke, Fifth Summ. 1: 35--37, 41, 43, 45, 47, & 52 (1971) and 2: 673, 698, 704, 705, & 915. 1971.

Poindexter, in a note appended to Poindexter 207-21, cited below, states that pollen fertility in the plant of which this is a specimen was only 17 percent and the chromosome number was $n = 7$.

The color photographs taken by my son, Dr. Andrew R. Moldenke, and cited by me in a previous installment of these notes, are all of A. R. Moldenke 1275 from Calhoun County, Illinois.

Additional citations: ILLINOIS: Henderson Co.: H. N. Patterson s.n. [Oquawka, July] (Pa). KANSAS: Cherokee Co.: Poindexter 207-21 (N). MISSOURI: Saint Louis: Eggert s.n. [Prairies, 14 August 1875] (Pa).

VERBENA INAMOENA Briq.

Additional bibliography: Moldenke, Phytologia 13: 203. 1966; Moldenke, Fifth Summ. 1: 188 (1971) and 2: 915. 1971.

VERBENA INCISA Hook.

Additional synonymy: Glandularia incisa (Hook.) Troncoso ex Cabrera, Fl. Prov. Buenos Aires 5a: 135. 1965.

Additional & emended bibliography: A. Gray, Man. Bot., ed. 3, lxvi (1862), ed. 4, pr. 1, lxvi (1863), and ed. 4, pr. 2, lxvi. 1864; A. Gray, Field For. & Gard. Bot., ed. 1, pr. 1, 242 (1868) and ed. 1, pr. 2, 242. 1869; A. Wood, Am. Bot. & Flor., ed. 1, pr. 1, 235 (1870), ed. 1, pr. 2, 235 (1871), ed. 1, pr. 3, 235 (1872), ed. 1, pr. 4, 235 (1873), ed. 1, pr. 5, 235 (1874), and ed. 1, pr. 6, 235. 1875; A. Gray, Field For. & Gard. Bot., ed. 1, pr. 3, 242. 1880; O. R. Willis in A. Wood, Am. Bot. & Flor., ed. 2, 235. 1889; Burkart, Excerpt. Bot. A.5: 586. 1962; Angely, Fl.

Anal. Paran., ed. 1, 571. 1965; Troncoso in Cabrera, Fl. Prov. Buenos Aires 52: 133 & 135. 1965; J. A. Clark, Card Ind. Gen. Sp. Var. issue 249. 1965; Yotaro, Gard. Pl. World 1: 131. 1965; Burkill, Dict. Econ. Prod. Malay Penins. 2: 2266. 1966; Moldenke, Phytologia 16: 188, 194, 208, & 212. 1968; Moldenke, Résumé Suppl. 16: 22 & 28. 1968; Moldenke in Menninger, Flow. Vines 338 & 339. 1970; Schnack & Rubens, Bol. Soc. Argent. Bot. 13: 205 & 206. 1970; Angely, Fl. Anal. Fitogeogr. Est. S. Paulo, ed. 1, 4: 839, map 1393. 1970; G. Taylor, Ind. Kew. Suppl. 14: 63. 1970; Moldenke, Fifth Summ. 1: 30, 177, 184, 188, 190, 201, & 371 (1971) and 2: 521, 652, 657, 662, 663, 670, 677, 683, 700, 703, 783, & 915. 1971; Moldenke, Phytologia 22: 471 & 491 (1972) and 23: 239. 1972.

Recent collectors have found this plant growing in high fertile campos. According to Religa, it is found abundantly in sunny, sandy, semitropical areas in Paraguay. Troncoso (1965) gives its overall distribution as "Brasil austral, Uruguay y litoral argentino. Barrancas del Paraná" and cites Boelcke 4968, Burkart 12764, and Nicora 3541 from Buenos Aires, Argentina, deposited in the San Isidro herbarium. Schnack & Rubens (1970) record it from Buenos Aires, Corrientes, Entre Ríos, and Santa Fé provinces.

Krapovickas is of the opinion that the natural hybrid between this species and V. temuisecta Briq. is V. calliantha Briq., which he says that he found growing very sparingly among large numbers of the two supposed parental species and which he says fails to produce fertile seed. I have been regarding xV. trinitensis Moldenke as the natural hybrid between these two species.

The corollas of V. incisa are described as having been "red" on Aguilar 55, Herrera 322, T. Rojas 322, and Terribile 871 & 882. Material has been misidentified and distributed in some herbaria under the name Glandularia peruviana (L.) Small.

Additional citations: BRAZIL: Rio Grande do Sul: H. M. Filho 353 (W—2483827). PARAGUAY: Religa s.n. [June 30, 1966] (Ws, Ws); R. Rojas 358a (Ws); Woolston 731 (N), 1353 (N). ARGENTINA: Buenos Aires: Fabris 4958 (N). Catamarca: Rodríguez V. 907 (Se—130299). Chaco: Aguilar 55 (S), 1056 (N), 1316 (N); Buratovich 72 (N), 167 (N); Malvarez 1133 (N); T. Rojas 2111 [Herb. Inst. Miguel Lillo 107893] (N). Córdoba: Terribile 871 (N), 882 (N). Corrientes: Malvarez 1452 (N). Formosa: Montes 2816 (N); I. Morel 2652 (N), 2694 (N), 2896 (N), 3113 (N), 3521 (N), 3566 (N), 3604 (N), 3624 (N), 3671 (N), 3705 (N), 3825 (N), 3844 (N), 3883 (N), 4112 (N), 4677 (N), 4869 (N), 5149 (N), 5317 (N), 5646 (N), 5751 (N), 5853 (N), 5925 (N), 6136 (N), 6319 (N), 6433 (N), s.n. [22-X-1948] (N); Pierotti 4123 (Se—130298), 6542 (N). Misiones: Montes 14662 (Ac, N, Rf); G. J. Schwarz 4717 (N). Santa Fé: Alvarez 987 (N). Tucumán: Herrera 322 (N); Olea 278 (N); Rocha 3683 (S).

VERBENA INCISA f. ALBIFLORA Osten & Moldenke

Additional bibliography: Moldenke, Phytologia 10: 112. 1964;

Moldenke, Fifth Summ. 1: 201 (1971) and 2: 677 & 915. 1971.

xVERBENA INHONESTA Moldenke

Additional bibliography: Moldenke, *Phytologia* 11: 468. 1965; Moldenke, Fifth Summ. 1: 371 (1971) and 2: 679, 705, & 915. 1971.

VERBENA INTEGRIFOLIA Sessé & Moc.

Additional & emended bibliography: Lewis & Oliv., *Am. Journ. Bot.* 48: [639]. 1961; Hocking, *Excerpt. Bot. A.* 6: 91. 1963; Moldenke, *Biol. Abstr.* 49: 4697 (1968) and 49 (10): B.A.S.I.C. S. 71 & S. 184. 1968; Moldenke, *Phytologia* 16: 188. 1968; Bolkh., Grif, Matvej., & Zakhar., *Chrom. Numb. Flow. Pl.* 717. 1969; Moldenke, Fifth Summ. 1: 76 (1971) and 2: 645, 678, & 915. 1971.

VERBENA INTEGRIFOLIA f. **ALBIFLORA** Moldenke

Bibliography: Moldenke, *Résumé Suppl.* 15: 3. 1967; Moldenke, *Biol. Abstr.* 49: 4697. 1968; Anon., *Biol. Abstr.* 49 (10): B.A.S.I.C. S. 184. 1968; Moldenke, *Phytologia* 16: 95. 1968; Moldenke, Fifth Summ. 1: 76 (1971) and 2: 915. 1971.

xVERBENA INTERCEDENS Briq.

Additional bibliography: Moldenke, *Phytologia* 14: 286. 1967; Moldenke, Fifth Summ. 1: 177, 188, 190, 201, & 371 (1971) and 2: 655, 688, & 915. 1971.

Additional citations: PARAGUAY: Woolston 785 (Go, N).

VERBENA INTERMEDIA Gill. & Hook.

Additional & emended bibliography: Reiche & Phil., *Fl. Chil.* 5: 295. 1910; Cabrera, *Man. Fl. Alred. Buenos Aires* 295 & 396, fig. 148 a--e. 1953; Darlington & Wylie, *Chrom. Atl.*, pr. 1, 323. 1956; Schnack, Fehleisen, & Cocucci, *Revist. Fac. Agron. La Plata* 35: [47] & [54], fig. 3. 1959; Darlington & Wylie, *Chrom. Atl.*, pr. 2, 323. 1961; Martínez-Crovetto, *Bonplandia* 1: 194 & 203. 1963; Troncoso in Cabrera, *Fl. Prov. Buenos Aires* 5: 127--130, fig. 45 E--G. 1965; Huynh, *Denkschr. Schweiz. Naturforsch. Gesel. [Mém. Soc. Helv. Sci. Nat.]* 85: 100. 1965; Martínez-Crovetto, *Bonplandia* 2: 39, 52, 53, 59, & 70 (1965) and 2: 131. 1967; Moldenke, *Résumé Suppl.* 16: 28. 1968; Moldenke, *Phytologia* 16: 95 & 184. 1968; Bolkh., Grif, Matvej., & Zakhar., *Chrom. Numb. Flow. Pl.* 717. 1969; Moldenke, Fifth Summ. 1: 177, 190, 201, & 371 (1971) and 2: 654, 655, 661, 663, 664, 672, 678, 693, 699, 700, & 915--916. 1971; Moldenke, *Phytologia* 22: 474. 1972.

Additional illustrations: Cabrera, *Man. Fl. Alred. Buenos Aires* 396, fig. 148 a--e. 1953; Schnack, Fehleisen, & Cocucci, *Revist. Fac. Agron. La Plata* 35: [54], fig. 3. 1959; Troncoso in Cabrera, *Fl. Prov. Buenos Aires* 130, fig. 45 E--G. 1965.

Recent collectors have found this plant growing on campos and report the vernacular name "verbena". It has been collected in fruit in April and December (in addition to the months previously reported by me). The corollas are described as "violet" on Burkart 19557, "blue" on Montes 14860 and A. G. Schulz 5842, and "lilac" on Krapovickas, Cristóbal, Maruñak, Pire, & Tressens

15319. Troncoso (1965) gives its overall distribution as "Sur del Brasil, Uruguay, NE. y centro de la Argentina. Abunda en la pradera primitiva, al borde de arroyos, vías férreas y en los valles de las sierras del S. de la Provincia [Buenos Aires]". She cites Cabrera 5630 and Hicken 475 & s.n. [Herb. San Isidro 3438] from Buenos Aires. Schnack and his associates (1959) report that this plant is apomictic in its natural form of reproduction.

Additional citations: URUGUAY: L. H. Bailey B.765 (Se--113022); Rosengurtt Gurvich B.765 (W--2562150); Rosengurtt Gurvich & Gal-linal 6018 (Se--129344). ARGENTINA: Corrientes: Burkart 19557 (W--2567974); Krapovickas & Cristóbal 16382 (Rf); Tressens & Albizzatri 24 (Rf). La Pampa: Fortuna 13 (N), 30 (N); A. G. Schulz 5842 (N). Mendoza: Lourteig 852 (N). Misiones: Krapovickas, Cristóbal, Marufiak, Pire, & Tressens 15319 (Rf); J. E. Montes 14866 (Au--270806, N, Rf, W--2556116). San Luis: Varela 692 (N).

VERBENA INTERMEDIA f. ALBIFLORA Moldenke

Additional bibliography: Moldenke, *Phytologia* 9: 384. 1963; Moldenke, *Fifth Summ.* 1: 201 (1971) and 2: 916. 1971.

VERBENA INTERMEDIA f. GLABRESCENS Hauman-Merck

Additional bibliography: Moldenke, *Phytologia* 9: 384. 1963; Moldenke, *Fifth Summ.* 1: 201 (1971) and 2: 916. 1971.

VERBENA INTERMEDIA var. LANUGINOSA Moldenke

Additional bibliography: Moldenke, *Phytologia* 9: 384--385. 1963; Moldenke, *Fifth Summ.* 1: 201 (1971) and 2: 916. 1971.

VERBENA JORDANENSIS Moldenke

Additional bibliography: Angely, *Fl. Anal. Paran.*, ed. 1, 572. 1965; Moldenke, *Phytologia* 16: 95. 1968; Angely, *Fl. Anal. Fito-geogr. Est. S. Paulo*, ed. 1, 4: 839 & xix, map 1393. 1970; Moldenke, *Fifth Summ.* 1: 177 (1971) and 2: 692 & 916. 1971.

Hatschbach has collected this species on rocky grassy campos. The corollas are described as "violet" on Hatschbach 22833, "lilac" on Hatschbach 22419, and "dark lilac" on Hatschbach 14883.

Additional citations: BRAZIL: Paraná: Hatschbach 14883 (W--2564554), 22833 (N, Rf), 33419 (Ac). Santa Catarina: Smith & Reitz 12479 (N).

xVERBENA KONDAI Moldenke

Additional bibliography: Moldenke, *Phytologia* 11: 468. 1965; Moldenke, *Fifth Summ.* 1: 371 (1971) and 2: 692, 700, & 916. 1971.

VERBENA KUNTZEANA Moldenke

Additional bibliography: Angely, *Fl. Anal. Paran.*, ed. 1, 572. 1965; Moldenke, *Phytologia* 11: 468. 1965; Moldenke, *Fifth Summ.* 1: 177, 188, & 201 (1971) and 2: 683 & 916. 1971.

VERBENA LACINIATA (L.) Briq.

Additional synonymy: *Verbena erinoideas* Lam. apud Baez, Anal. Asoc. Estud. Mus. Pop. Paraná 1920: 37, sphalm. 1920. *Verbena lacinata* (L.) Briq. ex Moldenke, Résumé Suppl. 3: 39, in syn. 1962. *Verbena laciniata* (Lam.) Briq. ex Moldenke, Résumé Suppl. 3: 39, in syn. 1962. *Veraena erinoides* Lam. ex Tawada, Biol. Mag. Okinawa 4 (6): 36, sphalm. 1967. *Verbena laciniata* (H.B.K.) Briq. ex Moldenke, Résumé Suppl. 16: 28, in syn. 1968. *Erimus laciniatus* L. apud Angely, Fl. Anal. Fitogeogr. Est. S. Paulo, ed. 1, 4: 839 & vii, sphalm. 1970.

Additional & emended bibliography: Balbis, Cat. Stirp. Hort. Acad. Taur. 80. 1813; Pers., Sp. Pl. 3: 346. 1819; Steud., Nom. Bot. Phan., ed. 1, 873. 1821; Jan, Elench. Pl. 1. 1831; A. Gray, Field For. & Gard. Bot., ed. 1, pr. 1, 242 (1868) and ed. 1, pr. 2, 242. 1869; A. Wood, Am. Bot. & Flor., ed. 1, pr. 1, 235 (1870), ed. 1, pr. 2, 235 (1871), ed. 1, pr. 3, 235 (1872), ed. 1, pr. 4, 235 (1873), ed. 1, pr. 5, 235 (1874), and ed. 1, pr. 6, 235. 1875; A. Gray, Field For. & Gard. Bot., ed. 1, pr. 3, 242. 1880; O. R. Willis in A. Wood, Am. Bot. & Flor., ed. 2, 235. 1889; L. H. Bailey in A. Gray, Field For. & Gard. Bot., ed. 2, 341. 1895; Briq. in Chod. & Wilczek, Bull. Herb. Boiss., sér. 2, 2: 544. 1902; T. Peckolt, Bericht. Deutsch. Pharm. Gesell. 14: 466. 1904; Reiche & Phil., Fl. Chil. 5: 287, 289, & 294--295. 1910; Baez, Anal. Asoc. Estud. Mus. Pop. Paraná 1920: 37. 1920; Noack, Biol. Zentralbl. 57: [383], 384, & 387, fig. 17. 1937; Baez, Mus. Entre Ríos Cart. Herb. Paran. 43. 1938; Fischer & Harshberger, Flower Fam. Alb. 86. 1941; J. A. Clark, Card Ind. Gen. Sp. Var. issue 183. 1944; E. L. D. Seymour, New Gard. Encycl., ed. 3, 1279 (1944), ed. 4, 1279 (1946), and ed. 5, 1279. 1951; Kuck & Tongg, Mod. Trop. Gard. 213. 1955; Darlington & Wylie, Chrom. Atl., pr. 1, 323. 1956; Schnack, Fehleisen, & Cocucci, Revist. Argent. Agron. 24: 132, 134, & 135. 1957; J. F. Macbr., Field Mus. Publ. Bot. 13 (5): 612, 614, 619, 623--626, & 629. 1960; Darlington & Wylie, Chrom. Atl., pr. 2, 323. 1961; Harler, Gard. Plains, ed. 4, 23, 24, 29, 238, & 250. 1962; E. L. D. Seymour, Wise Gard. Encycl., ed. 6, 1279. 1963; Troncoso in Böcher, Hjerting, & Rahn, Dansk Bot. Arkiv 22 (1): 109. 1963; E. L. D. Seymour, New Gard. Encycl., ed. 6, 1279 (1963) and ed. 7, 1279. 1964; R. Good, Geogr. Flow. Pl. 218. 1964; Backer & Bakh., Fl. Jav. 2: 596. 1965; J. & L. Bush-Brown, Am. Gard. Book, ed. 4, 327. 1965; Solbrig, Castanea 30: 173. 1965; Burkill, Dict. Econ. Prod. Malay Penins. 2: 2266. 1966; Greensill, Trop. Gardening 79. 1966; Hirata, Host Range & Geogr. Distrib. Powd. Mild. 277. 1966; E. Lawrence, South. Gard., ed. 2, 115, 135, 172, & 214. 1967; Tawada, Biol. Mag. Okinawa [Okinawa Seibutsugakkai] 4 (6): 36--37. 1967; Moldenke, Phytologia 16: 188 & 207. 1968; Moldenke, Résumé Suppl. 16: 28. 1968; Solbrig, Passani, & Glass, Am. Journ. Bot. 55: 1239. 1968; Bolkh., Grif, Matvej., & Zakhar., Chrom. Numb. Flow. Pl. 715--717. 1969; R. F. V. Cooper in Pastore, Bol. Soc. Argent. Hort. 157: 123--125. 1969; Angely, Fl. Anal. Fitogeogr. Est. S. Paulo, ed. 1, 4: 839,

vii, & xix, map 1393. 1970; E. L. D. Seymour, New Gard. Encycl., ed. 8, 1279. 1970; Moldenke, Fifth Summ. 1: 137, 143, 178, 184, 190, 193, 201, & 371 (1971) and 2: 492, 521, 522, 569, 664, 667, 668, 671, 678, 684, 686, 691, 696, & 916. 1971; Moldenke, Phytologia 23: 222, 223, & 231. 1972.

Additional illustrations: Noack, Biol. Zentralbl. 57: 387, fig. 17. 1937.

Sparre found this plant growing on dry slopes in Ecuador, while Fosberg refers to it as "prostrate, common in grassy places on top of low hill grazed by goats". The corollas are described as having been "violet" on Angulo & López 1346, "pale-violet" on Asplund 20147, "lavender" on Fosberg 27645, and "light to rather dark reddish-violet" on Asplund 20463, while Lourteig says "flor amarilla violacea muy aromática".

Macbride (1960) does not attempt to separate V. tenuisecta Briq., V. dissecta Willd., and V. laciniata (L.) Briq. in his key, lumping them all together in the line reading "Leaves mostly or all larger" [than 1 cm.]. Actually, a casual examination of the calyx or fruiting-calyx of each of these taxa under a hand-lens reveals quite distinct pubescence characters for separating them with comparative ease. He comments about V. laciniata: "Type from Peru by Feuillée. Stems wiry, prostrate, forming loose mats to a meter or more wide, the odorless, clear, mauve to violet flowers in flattened heads to 5 cm. across (Balls); as interpreted, leaves trifid or much divided, the Linnaean plant was said to have scarlet flowers (Hooker); red-violet (Schauer)." He cites the following specimens from Peru: Cuzco: Herrera 18, 3442, & 3450, Hicken s.n. [Sicuaní], Pennell 13677, Vargas 241. Huánuco: Macbride 1260. La Libertad: West 8115. Lima: Ferreya 6502, Killip & Smith 21754, Macbride 678, Raimondi 10703. Briquet (1902) cites Wilczek 44, while Troncoso (1963) cites Hicken 65.

Hirata (1966) records the fungus, Oidium verbenae, as infesting V. laciniata in Java, but it is not at all certain that the plant cultivated in Java and described by Backer & Bakhuizen van den Brink (1965) is really this species. I suspect that it is really V. tenuisecta Briq., as I suspect are also the plants referred to as V. erinoides by Lawrence (1967) and by Tawada (1967), while that discussed by Harler (1962) as "white verbenae" and "moss verbenae" is almost certainly V. tenuisecta var. alba Moldenke. It should be noted, in passing, that Tawada's paper is sometimes cited as "1968", but the first page of the issue is plainly dated December 25, 1967, as is also the first page of Tawada's article. He records the vernacular name "karakusa-baabena", but, again, it is most probable that this applies to V. tenuisecta rather than to the true V. laciniata.

Peckolt (1904) records a plant which he calls V. erinoides Lam. as being cultivated in Rio de Janeiro under the name "chá do Brasil", which he translates as "brasilianischer Tee". He describes the plant as a "Niederliegende Pflanze mit an der Basis

keilförmigen, in den Blattstiel verlaufenden, dreiteilig-fiederspaltigen Blättern. Blüten lilafarben. Die Infusion gilt beim Volke als menstruations- und lochienbeförderndes Mittel. Schwach geröstet, wird sie von den Familien der Arbeiter als Ersatz des indischen Tees benutzt." It seems most probable that this, also, as with most of the many other references in literature to "V. erinoides Lam.", refers to V. tenuisecta Briq., rather than to V. laciniata.

The Pfister 2177, distributed as V. laciniata, is actually V. berterii (Meisn.) Schau., while Soukup 4960 is V. occulta Moldenke, Troncoso 353 is V. santiaguensis (Covas & Schnack) Moldenke, and P. O. Schallert 251 is V. tenuisecta Briq.

Additional citations: ECUADOR: Chimborazo: Asplund 20463 (N); F. R. Fosberg 27645 (Rf). Cotopaxi: Sparre 15690 (S). Tunguragua: Asplund 20147 (N). PERU: Arequipa: Vargas Calderón 19434 (Ac). La Libertad: Angulo & López 1346 (Ac). Lima: López Guillén 670 (Rf); Riccio & Chumpitáz 3748 (Rf). ARGENTINA: Mendoza: Lourteig 772 (N).

VERBENA LACINIATA var. CONTRACTA (Lindl.) Moldenke

Additional bibliography: Moldenke, Phytologia 11: 469. 1965; Moldenke, Fifth Summ. 1: 193, 201, & 371 (1971) and 2: 667, 668, 684, & 916. 1971.

VERBENA LACINIATA var. SABINI (Sweet) Moldenke

Additional bibliography: Moldenke, Phytologia 11: 469. 1965; Moldenke, Fifth Summ. 1: 371 (1971) and 2: 667, 668, 678, 684, 694, & 916. 1971.

VERBENA LAEVIS Salmon ex Hirata, Host Range & Geogr. Distrib.

Powd. Mild. 277, nom. nud. 1966.

Bibliography: Hirata, Host Range & Geogr. Distrib. Powd. Mild. 277. 1966; Moldenke, Fifth Summ. 1: 375 (1971) and 2: 916. 1971.

Nothing is known to me of this plant except that Hirata (1966) states that it is attacked by the ubiquitous fungus, Erysiphe cichoracearum P. DC., giving "Salmon" as authority.

VERBENA LANDBECKI R. A. Phil.

Additional & emended bibliography: Reiche & Phil., Fl. Chil. 5: 285 & 287. 1910; Moldenke, Phytologia 13: 251. 1966; Moldenke, Fifth Summ. 1: 193 (1971) and 2: 679 & 916. 1971.

VERBENA LASIOTACHYS Link

Additional & emended bibliography: Steud., Nom. Bot. Phan., ed. 1, 873 & 874. 1821; Cheymol, Bull. Soc. Chim. Biol. 19: 1647--1653. 1937; Noack, Biol. Zentralbl. 57: 384 & 386, fig. 2. 1937; Anon., Chem. Abstr. 32: 2977. 1938; Howell, Marin Fl., ed. 1, 232--233. 1949; Abrams, Illustr. Fl. Pacif. States, pr. 1, 3: 610, 611, & 616, fig. 4344. 1951; Rattenbury, Madroño 15: 51. 1959; Ferris in Abrams & Ferris, Illustr. Fl. Pacif. States, pr. 1, 4:

651 & 730. 1960; J. H. Thomas, Fl. Santa Cruz Mtns., pr. 1, 294 & 434, fig. 192. 1961; Pusateri, Fl. Sierra Natl. Parks 104 & 105, fig. 138. 1963; Ferris in Abrams & Ferris, Illustr. Fl. Pacif. States, pr. 2, 4: 651 & 730. 1965; Hocking, Excerpt. Bot. A.9: 364. 1965; Raven, Kyhos, & Hill, Aliso 6: 113. 1965; Abrams, Illustr. Fl. Pacif. States, pr. 2, 3: 610, 611, & 616, fig. 434. 1967; Boivin, Naturaliste Canad. 94: 642. 1967; Ornduff, Reg. Veg. 50: 86 & 123. 1967; Boughey, Mus. Syst. Bio. Univ. Calif. Irvine Res. Ser. 1: 82. 1968; J. T. Howell, Calif. Bot. Club Trans-Sierran Phyt. Exped. 1968 p. 14. 1968; Moldenke, Phytologia 16: 188 & 200. 1968; Moldenke, Résumé Suppl. 16: 1 & 28. 1968; Munz, Suppl. Calif. Fl. 101. 1968; Munz & Keck, Calif. Fl. 686-688 & 1679. 1968; J. H. Thomas, Fl. Santa Cruz Mtns., pr. 2, 294 & 434, fig. 192. 1968; Bolkh., Grif, Matvej., & Zakhar., Chrom. Numb. Flow. Pl. 717. 1969; Farnsworth, Blomster, Quimby, & Schermerh., Lynn Index 6: 267. 1969; H. L. Mason, Fl. Marshes Calif., pr. 2, 677 & 877. 1969; J. T. Howell, Marin Fl., ed. 2, 232-233. 1970; Moldenke, Fifth Summ. 1: 18, 64-66, 76, & 371 (1971) and 2: 672, 674, 679, 680, 691, 693, 705, & 916. 1971; Rickett, Wild Fls. U. S. 5 (2): [455], 456, & 665, pl. 152. 1971; Moldenke, Phytologia 22: 458 & 467 (1972) and 23: 226 & 228. 1972.

Additional illustrations: Noack, Biol. Zentralbl. 57: 386, fig. 2. 1937; Abrams, Illustr. Fl. Pacif. States, pr. 1, 3: 616, fig. 434. 1951; J. H. Thomas, Fl. Santa Cruz Mtns., pr. 1, 294, fig. 192. 1961; Pusateri, Fl. Sierra Natl. Parks 104, fig. 138. 1963; Abrams, Illustr. Fl. Pacif. States, pr. 2, 3: 616, fig. 434. 1967; J. H. Thomas, Fl. Santa Cruz Mtns., pr. 2, 294, fig. 192. 1968; Rickett, Wild Fls. U. S. 5 (2): [455], pl. 152 [in color]. 1971.

The Madroño (1959) reference cited above is sometimes credited to Solbrig, but appears to be part of a series begun by Rattenbury and not otherwise accredited since.

Recent collectors have found V. lasiostachys growing on open hills and on the banks of streams. Howell (1949) says that it is rather rare in clay soil of open grassy places or the edge of brush in Marin County, California. Boughey (1968) refers to it as "occasional" in wet places in Orange County, while Thomas (1968) reports it from dry ground of disturbed areas, creek-bottoms, roadsides, and along the edge of brushy vegetation in the Santa Cruz Mountains, blooming there from May to September. He separates it from V. robusta Greene as follows:

V. lasiostachys — "Adaxial leaf-surfaces not scabrous; spikes loosely flowered in fruit."

V. robusta — "Adaxial leaf-surfaces scabrous; spikes densely flowered in fruit."

A. R. Moldenke 3396 is a very abnormal collection with foliaceous bracts in the young flower-spikes; according to the collector it appeared in the Stanford University greenhouse after insecticide sprays had been used therein — the plants were normal before the spraying and shoots which developed after the spraying had been completed were also normal.

Raven, Kyhos, & Hill (1965) report the chromosome number for V. lasiostachys as " $2n = 7$ " based on Raven 75411 from Los Angeles County, California, II and deposited in the herbarium of the University of California at Los Angeles. Munz (1968) quotes this as " $2n = 7$ pairs". Verbenaloside is reported from this species by Cheymol (1937). Boughey (1968) cites Booth 1171 from Orange County, California.

Boivin (1967) is of the opinion that Née 111, preserved in the Madrid herbarium and labeled as having been collected on Nootka Island, is actually mis-labeled and did not originate on that island, where, he maintains, this species of vervain is unknown. This assumption is very possible, since numerous others of Née's collections have been shown to be accompanied by erroneous locality data.

My son, Dr. Andrew R. Moldenke, reports that during the past several years' field work in California he has observed the following insects visiting the flowers of Verbena lasiostachys: Ashmeadiella cactorum basalis, A. californica, Bombus vosnesenskii, Ceratina acantha, C. michneri, C. nanula, C. pacifica, C. sequoiae, Chelostoma cockerellii, Chelostomopsis rubifloris, Epeolus americanus, Eulonchus marginatus, Geron sp., Heriades occidentalis, Hesperapis regularis, Hippodamia convergens, Hoplitis producta gracilis, Hylaeus cressoni, Lepidanthrax lauta, Megachile brevis onobrychia, M. gentilis, Melissodes lupina, Phycioides campestris, and Polites sabuleti. Of these, Ashmeadiella, Chelostoma, Chelostomopsis, Heriades, Hoplitis, and Megachile are megachilid bees, Bombus is a bumblebee, Ceratina is a carpenter bee, Epeolus and Melissodes are anthophorid bees, Eulonchus is a cyrtid fly, Geron and Lepidanthrax are bombyliid flies, Hesperapis is a melittid bee, Hippodamia is a lady beetle, Hylaeus is a colletid bee, and Phycioides and Polites are butterflies.

The McCulloch 2063c and Purer 5438, distributed as V. lasiostachys, are actually V. abramsi Moldenke, González Quintero 2868 is in part V. elegans H.B.K. and in part V. elegans var. asperata Perry, Cusick 4812, Getty 1, Hoover 9570, R. E. Nelson 158, Purer 5698 & 6755, and J. P. Tracy 18090 are V. lasiostachys var. septentrionalis Moldenke, and Cleveland s.n. [Sweetwater Valley] is V. robusta Greene.

Additional citations: CALIFORNIA: Los Angeles Co.: S. F. Blake 451 [Herb. Blake 1403] (Ld), 523 [Herb. Blake 1478] (Ld), 704 [Herb. Blake 1665] (Ld); Herb. James s.n. [1879] (W--2606745). Monterey Co.: L. W. Reinecke s.n. [September 5, 1937] (Se--144709); Youngberg s.n. [July 1938] (Se--136374). San Bernardino Co.: Munz 12313 (Se--129685). San Diego Co.: Gander 9471 (Sd--28844); I. L. Wiggins 2614 (Sd--48715, Se--186887). San Mateo Co.: Cummings & McCallum 3726 (Sd--38891). Ventura Co.: Purer

6703 (Sd—38892). County undetermined: M. Armstrong s.n. (Mi).
CULTIVATED: California: A. R. Moldenke 3396 (Ac, Z).

VERBENA LASIOSTACHYS f. ALBIFLORA Moldenke

Additional bibliography: Moldenke, *Phytologia* 13: 251. 1966;
Moldenke, *Fifth Summ.* 1: 65 (1971) and 2: 916. 1971.

VERBENA LASIOSTACHYS var. SCABRIDA Moldenke

Additional bibliography: Abrams, *Illustr. Fl. Pacif. States*, pr. 1, 3: 611. 1951; Ferris in Abrams & Ferris, *Illustr. Fl. Pacif. States*, pr. 1, 4: 730 (1960) and pr. 2, 4: 730. 1965; Abrams, *Illustr. Fl. Pacif. States*, pr. 2, 3: 611. 1967; Moldenke, *Phytologia* 16: 96. 1968; Munz & Keck, *Calif. Fl.* 688 & 1679. 1968; Moldenke, *Fifth Summ.* 1: 64 & 65 (1971) and 2: 679 & 916. 1971; Moldenke, *Phytologia* 22: 459. 1972.

Abrams (1951) reduces this taxon to synonymy under V. robusta Greene, but it seems more probable to me that it may represent a natural hybrid with that species.

VERBENA LASIOSTACHYS var. SEPTENTRIONALIS Moldenke

Additional bibliography: Abrams, *Illustr. Fl. Pacif. States*, pr. 1, 3: 611. 1951; Ferris in Abrams & Ferris, *Illustr. Fl. Pacif. States*, pr. 1, 4: 730 (1960) and pr. 2, 4: 730. 1965; Abrams, *Illustr. Fl. Pacif. States*, pr. 2, 3: 611. 1967; Moldenke, *Phytologia* 16: 96, 97, 188, & 200. 1968; Munz & Keck, *Calif. Fl.* 688 & 1679. 1968; Moldenke, *Fifth Summ.* 1: 64, 66, & 371 (1971) and 2: 656, 679, 685, 686, 691, & 916. 1971; Moldenke, *Phytologia* 22: 458. 1972.

Recent collectors describe this plant as 8—18 inches tall, growing on hillsides or in dry open ground with Hypericum perforatum and Aira caryophyllea. The corollas are described as having been "purple" on Dennis & Dennis 2255. Andrew R. Moldenke and I saw this plant growing and flowering in Tehama County, California, in July, 1968. A duplicate of the Cusick 4812 collection, cited below, was identified previously and cited by me in an earlier installment of these notes as typical V. lasiostachys Link. It should be re-examined.

Additional citations: OREGON: Jackson Co.: Cusick 4812 (Se—147070); Dennis & Dennis 2255 (N). Josephine Co.: Steward & Matthews 7188 (Se—202455). CALIFORNIA: Glenn Co.: R. E. Nelson 159 (Se—161066). Humboldt Co.: J. P. Tracy 18090 (Se—203785). Kern Co.: Jerabek s.n. [Hockett Place, July 1945] (Sd—36713). Mendocino Co.: J. P. Tracy 5059 (Se—203766). San Diego Co.: Getty 1 (Sd—50407); Purer 5698 (Sd—38889). San Luis Obispo Co.: Hoover 9570 (Au—297791). Santa Barbara Co.: Tucker 1983 (Se—157877). Trinity Co.: Moldenke & Moldenke 24848 (Ac, Rf). Ventura Co.: Purer 6755 (Sd—38893).

xVERBENA LECOCQI Moldenke

Additional bibliography: Moldenke, *Phytologia* 9: 473. 1964; Mol-

denke, Fifth Summ. 1: 371 (1971) and 2: 674, 679, & 916. 1971.

VERBENA LILACINA Greene

Additional bibliography: Moldenke, Phytologia 16: 97. 1968; Moldenke, Fifth Summ. 1: 76 & 78 (1971) and 2: 672 & 916. 1971.

Recent collectors describe this plant as a small suffrutescent perennial or a bush 2 feet tall, growing on salty flats or on the open slopes of peaks, occasionally on arroyo banks in canyons. Harbison found it to be "very abundant", but Moran saw only "a few". It has been collected in anthesis in February and in June, and in fruit in June (in addition to the months previously reported by me). The corollas are described as "pinkish-lavender" on Wiggins & Thomas 187 and "blue or light-blue" on C. H. Muller 10784. Material has been misidentified and distributed in some herbaria under the name V. gooddingii var. gooddingii Briq.

Additional citations: MEXICO: Baja California: C. F. Harbison s.n. [October 18, 1956] (Sd--46245); R. V. Moran 8195 (Sd--54632); Wiggins & Thomas 187 (W--2521929). MEXICAN OCEANIC ISLANDS: Cedros: Haines & Hale s.n. [9 March 1939] (Sd--45253); R. V. Moran 10669 (Sd--54043), 10698 (Sd--54041), 15162 (Sd--67635); C. H. Muller 10784 (Sd--51504).

VERBENA LILLOANA Moldenke

Additional bibliography: Moldenke, Phytologia 9: 474--475. 1964; Moldenke, Fifth Summ. 1: 201 (1971) and 2: 916. 1971.

The corollas on Olea 66 are described as having been "blue". The species has been collected in anthesis in July and in fruit in May, July, and December (in addition to the months previously reported by me).

Additional citations: ARGENTINA: Jujuy: Reales 617 (N), 631 (N). Tucumán: Olea 66 (N); F. Ortiz s.n. [30/5/45] (N).

VERBENA LINDBERGI Moldenke

Additional bibliography: Moldenke, Phytologia 9: 475--476. 1964; Moldenke, Fifth Summ. 1: 178 (1971) and 2: 916. 1971.

VERBENA LINDMANII Briq.

Additional bibliography: Angely, Fl. Anal. Paran., ed. 1, 572. 1965; Moldenke, Phytologia 16: 97. 1968; Moldenke, Fifth Summ. 1: 178 & 201 (1971) and 2: 680 & 916. 1971.

The corollas are described as "violet" on G. J. Schwarz 1078.

Additional citations: ARGENTINA: Misiones: G. J. Schwarz 1078 (N).

VERBENA LIPOZYGIODES Walp.

Additional bibliography: Reiche & Phil., Fl. Chil. 5: 289 & 293. 1910; Moldenke, Phytologia 14: 287. 1967; Moldenke, Fifth Summ. 1: 193 (1971) and 2: 680 & 916. 1971.

VERBENA LITORALIS H.B.K.

Additional & emended synonymy: Verbena litoralis Humb. & Bonpl.

ex Steud., Nom. Bot. Phan., ed. 1, 873. 1821. Verbena littoralis H.B.K. apud Walp., Repert. Bot. Syst. 4: 20, in syn. 1845; Hook. f., Trans. Linn. Soc. Lond. Bot. 20: 195. 1847. Verbena bonariensis sensu H. Mann, sensu Hillebr., sensu Heller, sensu Forbes, sensu Rechinger, sensu Frear, and sensu St. John & Hosaka apud Degener, Fl. Hawaii. 315: Verbena: Litoralis, in syn. 1960 [not V. bonariensis Dill., 1938, nor L., 1753, nor Rendle, 1904, nor Schau., 1960, nor Vell., 1959]. Verbena nudiflora "Nutt. ex Turcz." ex Moldenke, Résumé Suppl. 18: 14, in syn. 1969.

Additional & emended bibliography: Steud., Nom. Bot. Phan., ed. 1, 873. 1821; Speg., Anal. Soc. Ci. Argent. 9: 174. 1880; Briq. in Chod. & Wilczek, Bull. Herb. Boiss., sér. 2, 2: 543. 1902; T. Peckolt, Bericht. Deutsch. Pharm. Gesell. 14: 466. 1904; Speg., Anal. Mus. Nac. Buenos Aires 19: 323. 1909; Reiche & Phil., Fl. Chil. 5: 283. 1910; Sacc. & Trott, Syll. Fung. 21: 775. 1912; Speg., Rev. Argent. Bot. 1: 95 & 102. 1925; H. S. Jacks., Mycologia 24: 62. 1932; Cheymol, Bull. Soc. Chim. Biol. 19: 1647—1653. 1937; Noack, Biol. Zentralbl. 57: 384 & 386, fig. 10. 1937; Anon., Chem. Abstr. 32: 2977. 1938; Baez, Mus. Entre Ríos Cart. Herb. Paran. 43. 1938; Abrams, Illustr. Fl. Pacif. States, pr. 1, 3: 610. 1951; Cabrera, Man. Fl. Alred. Buenos Aires 395 & 397. 1953; Darlington & Wylie, Chrom. Atl., pr. 1, 323. 1956; Cuatrecasas, Revist. Acad. Colomb. Cienc. 10: 259. 1958; Schnack, Fehleisen, & Cocucci, Revist. Fac. Agron. La Plata 35: 49, [54], & 55, fig. 3. 1959; J. F. Macbr., Field Mus. Publ. Bot. 13 (5): 613, 615, 617, 621, 624, & 628. 1960; Ferris in Abrams & Ferris, Illustr. Fl. Pacif. States, pr. 1, 4: 730. 1960; Darlington & Wylie, Chrom. Atl., pr. 2, 323. 1961; Martínez-Crovetto, Bonplandia 1: 112 & 132. 1962; Troncoso in Böcher, Hjerting, & Rahn, Dansk Bot. Arkiv 22 (1): 109. 1963; Angely, Fl. Anal. Paran., ed. 1, 572. 1965; Huynh, Denkschr. Schweiz. Naturforsch. Gesell. [Mém. Soc. Helv. Sci. Nat.] 85: 100. 1965; Ferris in Abrams & Ferris, Illustr. Fl. Pacif. States, pr. 2, 4: 730. 1965; Troncoso in Cabrera, Fl. Prov. Buenos Aires 5: 128 & 132. 1965; Hirata, Host Range & Geogr. Distrib. Powd. Mild. 277. 1966; Meyer & Weyrauch, Inst. Mig. Lill. Misc. 23: 64 & 123. 1966; Rzedowski & McVaugh, Contrib. Univ. Mich. Herb. 9: 76 & 107. 1966; Abrams, Illustr. Fl. Pacif. States, pr. 2, 3: 610. 1967; Mueller-Dombois & Lamoureux, Pacif. Sci. 21: 298. 1967; Ornduff, Reg. Veg. 50: 86. 1967; Alzate, Pl. Medic., ed. 7, 264—265. 1968; Pollak-Oltz, Anal. Anthropol. Gesell. Wien 98: 51—58. 1968; Kunkel, Willdenowia 4: 351. 1968; Moldenke, Phytologia 16: 87, 97—99, 101, 102, & 342. 1968; Moldenke, Résumé Suppl. 16: 4, 6, 11, & 28 (1968) and 17: 3 & 7. 1968; Munz, Suppl. Calif. Fl. 101. 1968; Munz & Keck, Calif. Fl. 686, 687, & 1679. 1968; W. T. Pope, Man. Wayside Pl. 192, pl. 110. 1968; Bolkh., Grif, Matvej., & Zakhar., Chrom. Numb. Flow. Pl. 717. 1969; Farnsworth, Blomster, Quimby, & Schermerh., Lynn Index 6: 267. 1969; H. L. Mason, Fl. Marshes Calif., pr. 2, 676 & 877. 1969; A. L. Moldenke, Phytologia 18: 126. 1969; Moldenke, Biol. Abstr. 50: 418. 1969; Rickett, Wild Fls. U. S. 3 (2): 364 & [367], pl. 111. 1969; Angely, Fl. Anal. Fitogeogr. Est. S. Paulo, ed. 1,

4: 839, 840, & xix, map 1394. 1970; Dennis, Kew Bull. Addit. Ser. 3: 372. 1970; Gibson, Fieldiana Bot. 24 (9): 230 & 232-233. 1970; Moldenke, Phytologia 20: 80. 1970; Moldenke in Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. Bot. 6:] 1314 & 1318. 1970; Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. Bot. 6:] 1876 & 1877. 1970; Oberwinkler, Pterid. & Sperm. Venez. 19, 20, & 78. 1970; Anon., Biol. Abstr. 52 (3): B.A. S.I.C. S.247. 1971; Farnsworth, Pharmacog. Titles 6 (9): xii & title 16428. 1971; Moldenke, Biol. Abstr. 52: 1316. 1971; Moldenke, Excerpt. Bot. 18.A: 445. 1971; Moldenke in Wiggins & Porter, Fl. Galáp. Isls. 504-508, fig. 133. 1971; Moldenke, Fifth Summ. 1: 27, 47, 49, 59, 64, 66, 76, 81, 82, 84-86, 89, 91, 120, 128, 137, 138, 144, 178, 184, 188, 190, 193, 194, 201, 205, 257, 312, 349-351, 353, & 371 (1971) and 2: 558, 559, 649, 652, 654, 655, 672, 674, 679-682, 686, 688, 708, & 916. 1971; Rickett, Wild Fls. U. S. 5 (2): [455], 456, & 665, pl. 152. 1971; Wiggins & Porter, Fl. Galáp. Isls. 997. 1971; Moldenke, Phytologia 22: 478 & 489 (1972) and 23: 182, 185, 225, & 233. 1972.

Additional illustrations: Noack, Biol. Zentralbl. 57: 386, fig. 10. 1937; Schnack, Fehleisen, & Cocucci, Revist. Fac. Agron. La Plata 35: [54], fig. 3. 1959; W. T. Pope, Man. Wayside Pl. 192, pl. 110 [as *V. bonariensis*]. 1968; Moldenke in Wiggins & Porter, Fl. Galáp. Isls. [507], fig. 133. 1971.

Recent collectors describe this plant as an herb to 1.5 m. tall and have found it growing in low-lying grasslands near rivers, in fields, in limestone sinks with steep walls in oak woods, in dense woodlands, cloud forests, open fields, and second-growth, in potreros and cultivated areas, on valley floors, grassy valley floors, wet land, and high ridges, along roadsides and wet roadsides in the open sun, streambanks, and village fencerows, by small ponds in *Pinus-Liquidambar* forests, at the edge of ditches, and among scrubby growth on hilltops.

Pennington claims that *V. litoralis* is an "excellent pasturage plant". Mears found it to be "fairly common in open sunlight" in San Luis Potosí, Mexico, while the Andersons call it an "abundant roadside weed" in Guerrero. Taylor describes it as a "weed at edge of forest adjacent to old fields in volcanic very moist gray-black soil" in Costa Rica and Tyson refers to it as "common" in Chiriquí, Panama. Duke found it growing in areas receiving about 80 inches of annual rainfall. Mueller-Dombois & Lamoureux (1967) state that it is found in two of the "kipukas" in Hawaii Volcanoes National Park, these being older areas on the slopes of volcanic mountains that have been surrounded by more recent lava flows, serving as vegetation islands providing seed sources for the re-invasion of the surrounding new volcanic material.

The corollas are described as having been "blue" on Anderson & Anderson 4928, Breedlove 14429, Contreras 5241, J. A. Duke 9072, Ebinger 811, Laughlin 652, Lewis, Burch, Dwyer, Elias, Escobar, Oliver, & Robertson 339, Williams, Molina R., Williams, & Gibson 29384, and Woodson, Allen, & Seibert 858, "pale-blue" on Breedlove & Thorne 17993, "bluish" on Herb. Inst. Miguel Lillo 738,

"dark-blue" on P. H. Allon 1412, "bright lavender-blue" on Seibert 169, "lilac" on E. Contreras 6152, Molina R. 22258, and Molina R. & Molina 24265, "magenta" on Tyson, Dwyer, & Blum 4300, "lavender" on Bunting & Licht 976, Croat 10444, R. McVaugh 16949, C. W. Palmer 105, Tyson 5627 & 5675, and E. H. Walker 8127, "pale-lavender" on Camp 2433 and E. H. Walker 8103, "pink" on Gentle 6481, "pinkish" on Gentle 7119, "purple" on Blum, Olson, & Rasmussen 2409, F. R. Fosberg 27947, Gutiérrez R. 58, and Martínez-Calderón 1471, "light-purple" on J. W. L. Robinson 8, "pale-purple" on Molina R., Burger, & Wallenta 16234, and "pale-violet" on Asplund 18329.

Schnack and his associates (1959) report this species to be apomictic in its natural method of reproduction. The vernacular names, "cotacán", "mountain verbena", "verbena de montaña", and "verbena fina", have been recorded for this species (in addition to the names previously reported by me). Peckolt (1904) records the vernacular name "herva de pai S. Caetano", which he translates as "Cajetans Vaterkraut". He describes the plant as "Meterhohe Pflanze mit sitzenden, lanzettlichen Blättern. Blüten blau in kurzen, zylindrischen Ähren. Wird allgemein als Ersatz der Verbena officinalis L. benutzt." Judging from his brief description, it seems that he has misapplied the specific name to V. brasiliensis Vell., which has sessile leaves. He is not alone in making this misidentification! The "Verbena litoralis" of Mason (1969) is certainly also actually V. brasiliensis, and the illustration given by Rickett (1969) and labeled as depicting V. bonariensis and "V. littoralis" actually shows V. bonariensis (in the foreground) and V. brasiliensis (in the rear).

Kunkel (1968) is of the opinion that the "V. hispida Ruiz & Pav." of Reiche [Anal. Mus. Nac. Chile, 1903] is actually V. litoralis — he cites Kunkel R.70 from La Mocha Island, Chile. In regard to New Zealand material, Healy comments that "this plant appears to have been included under V. officinalis [in previous literature], but is markedly different from southern [New Zealand] plants".

Alzate (1968) confirms Peckolt's statement that V. litoralis can be used as a substitute for V. officinalis in South American folk medicine. Cheymol (1937) reports the presence of verbenal-oxide in V. litoralis. Ornduff (1967) and Munz (1968) report its chromosome number as $2n = 56$. Cuatrecasas (1958) reports the species from Valle del Cauca, Colombia, and Briquet (1902) cites Wilczek 56 from southern Brazil.

A letter received by me from Julia F. Morton, dated June 2, 1969, is of interest: "The USDA Plant Quarantine people have encountered [V. litoralis] three times in the past month in the possession of travelers coming in from Guatemala. All were raving about the wonderful effect of the 'tea' [made from this plant] in lowering blood pressure. It was first brought to my

attention by a Fort Lauderdale doctor who confirmed that her patient's blood pressure went down after taking this remedy. It coincided with the first time the USDA people saw a bundle of the dried plant being brought in by a 70-year-old man."

Troncoso (1965) gives the overall distribution of the species as "América cálida y templada. Común en campos secos y altos, invasore de cultivos", citing Cabrera 1710, Rodríguez 93, and Troncoso s.n. [Herb. San Isidro 1493] from Buenos Aires, Argentina. She reduces V. brasiliensis Vell. to synonymy under V. litoralis, but the two species are abundantly distinct. Munz (1968) comments under V. brasiliensis "Confused with V. litoralis HBK, but the infl. more condensed, the pubescence of rachis, bracts and calyx more spreading". He then separates them as follows: V. litoralis -- inflorescence lax, elongate; flowers distant; pubescence on rachis, bractlets, and calyx very minute, closely appressed.

V. brasiliensis -- inflorescence dense, contracted; flowers mostly congested; pubescence on rachis, bractlets, and calyx spreading.

Macbride (1960) notes that "Hooker and Schauer added a [second] 't' to the name; the former remarked [Hook. Bot. Misc. 1: 166. 1830]: seems to be a variety [of V. bonariensis] with shorter spikes than usual" -- but here, again, the plant actually referred to is V. brasiliensis. Macbride continues with the remarkable statement that "Actually, most material referred here seems doubtfully distinct from V. carolina L.", but the Mexican and Central American V. carolina really has very little resemblance to V. litoralis. He cites the following Peruvian specimens of V. litoralis: Amazonas: Williams 7534. Arequipa: Guenther & Buchtien 132. Cajamarca: Bonpland s.n. [Truxillo], Osgood & Anderson 36. Cuzco: Herrera 1505, 1664, & 3362. Huánuco: Macbride 1705, Woytkowski 34175. Junín: Schunke 1724. Lima: Killip & Smith 21541, Macbride 54. Loreto: Williams 1297, 4367, & 7894. San Martín: Williams 5911.

Macbride notes that Humboldt, Bonpland, & Kunth (1817) "gave Truxillo, Santa and Lima specimens as type collections" -- actually cotype collections -- but he designates the Truxillo one as the "type", which, under the present edition of the International Rules of Botanic Nomenclature, he is entitled to do. In this connection it should be noted that the photograph cited below of Nuttall s.n. [Wahoo] indicates that the type of V. nudiflora Nutt. is deposited in the British Museum herbarium.

Hitherto the poor specimen in the herbarium of the Academy of Natural Sciences at Philadelphia has been regarded by the curators there as the type, "too valuable" to lend even for examination by a monographer.

Jackson (1924) reports the fungus, Aecidium verbenae Speg., as attacking V. litoralis. He regards A. verbenicola Speg. [not A.

verbenicola Ellis & Kellerman, 1884], A. spegazzinianum Sacc. & Trott., A. elongatum Speg., and A. verbeniphilum Speg. as synonyms of A. verbenae, but admits that "There is some doubt whether or not all the names listed above belong to one species. Spegazzini evidently considered that there were at least two forms. His A. Verbenae he thought to be the aecial stage of Puccinia elongata Speg. The latter, however, seems, from the description, to be a short cycled form." He cites H. S. Jackson 1180, 1272, & 1454 from Rio de Janeiro and 1380 & 1479 from Minas Gerais and São Paulo, Brazil. Hirata (1966) adds Oidium sp. from South America, while Dennis (1970) adds Septoria verbenae Rob. & Desm.

Material of V. litoralis has been misidentified and distributed in some herbaria as V. carolina L., V. ehrenbergiana Schau., V. recta H.B.K., and V. townsendi Svenson. On the other hand, the Nicora 663, distributed as V. litoralis, is actually V. bonariensis L., Cory 50840 is V. brasiliensis Vell., Sagástegui A. 7192 is V. glabrata H.B.K., Rambo 45339 is V. minutiflora Briq. [not V. montevidensis as previously reported by me], Nicora 377 and Troncoso 357 are V. montevidensis Spreng., Edwin & Schunke V. 3746 and López-Palacios 2552 are V. parvula Hayek, and R. V. Moran 5793 & 5817 are V. sphaerocarpa Perry. The Alvarez 951 and Archer 4788, previously cited by me as representing the typical form of Verbena litoralis, seem, rather, to represent its var. caracasana (H.B.K.) Briq.

Additional citations: MEXICO: Chiapas: Breedlove 14429 (Mi, N); Laughlin 652 (Mi). Chihuahua: Pennington 55 (Au—264053). Guerrero: Anderson & Anderson 4928 (Mi). Hidalgo: González Quintero 732 (Au—249483, Ip). Jalisco: Díaz Luna 460 (Mi); R. McVaugh 16949 (N). México: Chavez s.n. [5-V-1963] (Ip); M. E. Díaz 18 (Ac); Mitastein 24 (Ip), 72 (Ip). Michoacán: Hinton 12156 (Se—97689), 12520 (Se—117423). Oaxaca: Camp 2433 (N). Puebla: Gutiérrez R. 58 (Ac). San Luis Potosí: Mears 492a (Au). Sinaloa: Breedlove & Thorne 17993 (Ac). Veracruz: Martínez Calderón 1471 (Mi, N); Rosas R. 512 (Rf). GUATEMALA: El Petén: E. Contreras 6152 (W—2558713); C. L. Lundell 16386 (N). El Quiché: E. Contreras 5241 (Au—278574). Sololá: Molina R., Burger, & Wallenta 16234 (N, N). Department undetermined: Collector undesignated s.n. (Jm). BRITISH HONDURAS: Gentle 6481 (Au—239635, S), 7119 (Mi). HONDURAS: Distrito Central: Gillis 9065 (Ft, Ft. Go); Nelson & Barkley 39458 (Ac). Intibucá: Barkley & Barkley 40349 (Ac). La Paz: Molina R. & Molina 24265 (N). Ocotepeque: A. Molina R. 22258 (N). NICARAGUA: Carazo: F. C. Seymour 570 (Vt). Matagalpa: Bunting & Licht 976 (N); Zelaya M. 2324 (N). COSTA RICA: Alajuela: Molina R., Williams, Burger, & Wallenta 17513 (N). Cartago: R. J. Taylor 4208 (N). Puntarenas: C. W. Palmer 105 (N).

San José: Williams, Molina R., Williams, & Gibson 29384 (N). PANAMA: Chiriquí: P. H. Allen 1442 (E--1190850); Croat 10444 (N); J. A. Duke 9072 (E--1841794); Dwyer & Hayden 7738 (E--1925953); Ebinger 811 (W--2561792); Lewis, Burch, Dwyer, Elias, Escobar, Oliver, & Robertson 339 (E--1881984, W--2589452); Seibert 169 (E--1110249); E. L. Tyson 5627 (E--1980019), 5675 (E--1980017); Woodson, Allen, & Seibert 858 (E--1171088). Panamá: Blum, Olson, & Rasmussen 2409 (E--1974177); Tyson, Dwyer, & Blum 4300 (E--1889209). COLOMBIA: Cundinamarca: Barkley & Wrigley 38838 (Rf); Humbert, Fernandez, Idrobo, & Jaramillo 27159 (N, S). Valle del Cauca: J. W. L. Robinson 8 (W--2563571). Department undetermined: Mutis 3688 (W--1562719). VENEZUELA: Mérida: López-Palacios 2035 (Ft). ECUADOR: Chimborazo: Asplund 15501 (N). El Oro: Asplund 15820 (N). Guayas: Valverde 479 (Ws). Loja: D. H. Knight 781 (Ws). Los Ríos: Játiva & Epling 55 (N). Napo-Pastaza: Asplund 18329 (N). GALAPAGOS ISLANDS: Indefatigable: L. A. Fournier 97 (Rf). PERU: Arequipa: Vargas Calderón 8462 (Ac), 18250 (Ac). Cajamarca: Ugent & Ugent 5512 (W--2558166). Cuzco: Vargas Calderón 14580 (Ac), 17076 (Ac). Lambayeque: F. R. Fosberg 27947 (Rf). BRAZIL: Rio Grande do Sul: Rambo 45117 (Au--122320). BOLIVIA: Santa Cruz: I. Peredo s.n. [23-IV-1946] (Se--130300). PARAGUAY: Woolston 107 (N). ARGENTINA: Buenos Aires: R. Alvarez 314 (N). Catamarca: Brizuela 696 (N); Luna Risso 1058 (N). Formosa: I. Morel 2810 (N), 4369 (N), 4862 (N), 4916 (N). Jujuy: Garolera & Romero s.n. [11-I-1947] (N). Misiones: G. J. Schwarz 5383 (N). San Luis: Varela 739 (N). Santiago del Estero: P. Garcia s.n. [Herb. Inst. Miguel Lillo 738] (N). RYUKYU ISLAND ARCHIPELAGO: Okinawa: E. H. Walker 8103 (W), 8127 (Rf, W--2619387). NEW ZEALAND: North: Healy 50/215 (Nz--70251), 50/218 (Nz--70250). HAWAIIAN ISLANDS: Oahu: Nuttall s.n. [Wahoo; F. G. Mey. photo 3129] (N--photo). AUSTRAL ISLANDS: Raiavvae: Whitney Exped. 258 (N).

VERBENA LITORALIS var. ALBIFLORA Moldenke

Additional bibliography: Moldenke, *Phytologia* 13: 206. 1966; Moldenke, *Fifth Summ.* 1: 76, 120, & 144 (1971) and 2: 916. 1971.

VERBENA LITORALIS var. CARACASANA (H.B.K.) Briq.

Additional & emended synonymy: *Verbena caracasana* H.B.K., Nov. Gen. & Sp. Pl., ed. folio, 2: 223. 1817. *Verbena caracasana* Humb. & Bonpl. ex Steud., Nom. Bot. Phan., ed. 1, 872. 1821.

Additional & emended bibliography: Steud., Nom. Bot. Phan., ed. 1, 873. 1821; Barnhart, Bull. Torrey Bot. Club 29: 590. 1902; Moldenke, *Phytologia* 16: 99. 1968; Moldenke, *Résumé Suppl.* 16: 7 & 28 (1968) and 17: 3 & 7. 1968; Moldenke, *Fifth Summ.* 1: 120, 128, 184, 188, 201, & 350 (1971) and 2: 660, 680, 916, & 967. 1971.

Recent collectors describe this plant as an upright herb, 0.3-1 m. tall, the calyx green-ochre and the corolla blue (R. F. Steinbach 699) or white (Nevling & Gómez-Pompa 1033), growing at altitudes of 700 to 2020 m. Steinbach describes it as "common" in rocky soil along roadsides in Bolivia, while in New Zealand it is said by Healy to be "established on roadsides and waste land". The latter collector notes that "this plant appears to have been included under V. officinalis [in previous lists of New Zealand plants], but is markedly different from southern [New Zealand] plants."

The R. Alvarez 951 and W. A. Archer 4788, cited below, were previously cited by me as typical V. litoralis H.B.K., but they certainly are not representative of the typical form of that admittedly very variable taxon. They have the appearance of large-spiked V. montevidensis Spreng. and are placed here in V. litoralis var. caracasana tentatively until the true status of this and related taxa can be more fully investigated.

If the following collections actually do represent this variety, then it has been collected in anthesis and fruit in January, February, April, June, and December, it is known in the vernacular as "vervena", and is used as a general remedy for coughs in folk medicine.

Additional & emended citations: MEXICO: Veracruz: Nevling & Gómez-Pompa 1033 (Ac). BOLIVIA: Cochabamba: R. F. Steinbach 699 (W-2533500, Ws). PARAGUAY: W. A. Archer 4788 (N). ARGENTINA: Córdoba: Rufz Huidobro s.n. [San Martin] (N); Timmermann 71123 (Au-302449). Formosa: I. Morel 2188 (Rf). Jujuy: O'Donell 2914 (N). Santa Fé: R. Alvarez 951 (N). Tucumán: T. Meyer 15121 (Au-122322). NEW ZEALAND: North: Healy 50/74 (Nz-70252, Rf, Z), 50/215 (Nz-93824).

VERBENA LITORALIS var. CONGESTA Moldenke

Bibliography: Moldenke, *Phytologia* 20: 80. 1970; Moldenke, *Biol. Abstr.* 52: 1316. 1971; Anon., *Biol. Abstr.* 52 (3): B.A.S.I. C. S.247. 1971; Moldenke, *Excerpt. Bot.* 18.A: 445. 1971; Moldenke, *Fifth Summ.* 1: 76 (1971) and 2: 916 & 973. 1971.

Breedlove & Thorne found this plant growing on steep moist north-facing slopes with Clethra, Cornus, Molinadendron, Ostrya, Pinus, and Quercus, flowering and fruiting in September, and describe the color of the corollas as "blue".

Citations: MEXICO: Sinaloa: Breedlove & Kawahara 16735 (Z-type); Breedlove & Thorne 18277 (Mi).

VERBENA LITORALIS var. MELANOPOTAMICA Hauman-Merck

Additional bibliography: Moldenke, *Phytologia* 10: 78-79. 1964; Moldenke, *Fifth Summ.* 1: 201 (1971) and 2: 916 & 973. 1971.

VERBENA LOBATA Vell.

Additional bibliography: Barroso, *Rodriguésia* 32: [69] & 70.

1957; Cabrera, Bol. Soc. Argent. Bot. 6: 272. 1957; Angely, Fl. Anal. Paran., ed. 1, 572. 1965; Moldenke, Phytologia 16: 99. 1968; Moldenke, Résumé Suppl. 16: 6. 1968; Angely, Fl. Anal. & Fitogeogr. Est. S. Paulo, ed. 1, 1: xli. (1969) and 4: 839, 840, & xix, map 1394. 1970; Moldenke in Menninger, Flow. Vines 338. 1970; Moldenke, Fifth Summ. 1: 178, 190, & 201 (1971) and 2: 657, 664, 681, 682, & 916. 1971.

Additional citations: BRAZIL: Rio Grande do Sul: Palacios & Cnezzo 895 (N).

VERBENA LOBATA var. GLABRATA Moldenke

Additional bibliography: Moldenke, Phytologia 12: 207. 1966; Moldenke, Fifth Summ. 1: 178 & 190 (1971) and 2: 916. 1971.

VERBENA LOBATA var. HIRSUTA Moldenke

Additional bibliography: Moldenke, Phytologia 16: 99. 1968; Moldenke, Résumé Suppl. 16: 6. 1968; Moldenke, Fifth Summ. 1: 178 & 188 (1971) and 2: 916. 1971.

The corollas on Hatschbach 14898 are described as having been "lilac" in color when fresh.

Additional citations: BRAZIL: Paraná: Hatschbach 14898 (W—2564580).

VERBENA LOBATA var. SESSILIS Moldenke

Additional bibliography: Cabrera, Bol. Soc. Argent. Bot. 6: 272. 1957; Angely, Fl. Anal. Paran., ed. 1, 572. 1965; Moldenke, Phytologia 16: 99. 1968; Moldenke, Fifth Summ. 1: 178 (1971) and 2: 916. 1971.

VERBENA LONGIFOLIA Mart. & Gal.

Additional bibliography: Hocking, Excerpt. Bot. A.11: 504. 1967; Moldenke, Phytologia 14: 288. 1967; Moldenke, Biol. Abstr. 49: 4199. 1968; Moldenke, Fifth Summ. 1: 76 (1971) and 2: 660 & 916. 1971.

Dieterle found this plant growing in flat pastured red clay land with shallow pools in an area of low ground with shallow surface water, describing the color of the corollas as "dark-purple". In addition to the months previously reported by me, the species has been collected in flower and fruit in June.

Additional citations: MEXICO: Guerrero: Ryan & Floyd 84 (Ca—1285492). Jalisco: J. V. A. Dieterle 3578 (Mi).

VERBENA LONGIFOLIA f. ALBIFLORA Moldenke

Additional bibliography: Moldenke, Phytologia 13: 207. 1966; Moldenke, Fifth Summ. 1: 76 (1971) and 2: 916. 1971.

VERBENA LONGIFOLIA var. PUBESCENS Moldenke

Additional bibliography: Hocking, Excerpt. Bot. A.11: 504. 1967; Moldenke, Phytologia 14: 288. 1967; Moldenke, Biol. Abstr. 49: 4199. 1968; Moldenke, Fifth Summ. 1: 76 (1971) and 2: 916. 1971.

VERBENA LUCANENSIS Moldenke

Additional bibliography: J. F. Macbr., Field Mus. Publ. Bot. 13 (5): 613, 614, & 624--625. 1960; Moldenke, Phytologia 14: 288. 1967; Moldenke, Fifth Summ. 1: 144 (1971) and 2: 916. 1971.

VERBENA LUDOVICIANA Hirata

Bibliography: Hirata, Host Range & Geogr. Distrib. Powd. Mild. 277. 1966; Moldenke, Fifth Summ. 1: 375 (1971) and 2: 916. 1971.

Nothing is known to me of this plant except that it is listed by Hirata (1966) as a host for the ubiquitous fungus, Erysiphe cichoracearum P. DC. in the United States.

VERBENA MACDOUGALII Heller

Additional & emended synonymy: Verbena macdougalii Heller ex Moldenke, Suppl. List Invalid Names 9, in syn. 1941; Hirata, Host Range & Geogr. Distrib. Powd. Mild. 277. 1966. Verbena macdougalii Shinn, Univ. Kans. Sci. Bull. 46: 881. 1967.

Additional & emended bibliography: Rydb., Fl. Rocky Mtns., ed. 2, pr. 1, 739 & 740. 1922; Tidestr., Contrib. U. S. Nat. Herb. 25 [Fl. Utah & Nev.], pr. 1, 469. 1925; Wyman & Harris, Navajo Ind. Ethnobot. [Univ. N. M. Bull. 366 (Anthrop. Ser. 3, 5):] 32 & 45. 1941; Rydb., Fl. Rocky Mtns., ed. 2, pr. 2, 739 & 740. 1954; Howell & McClintock in Kearney & Peebles, Ariz. Fl., ed. 2, 725--727. 1960; Lewis & Oliv., Am. Journ. Bot. 48: [639]--641, fig. 17. 1961; Hocking, Excerpt. Bot. A.6: 91. 1963; Hirata, Host Range & Geogr. Distrib. Powd. Mild. 277. 1966; Shinn, Univ. Kans. Sci. Bull. 46: 881. 1967; Burlage, Ind. Pl. Tex. 184, 206, 223, & 242. 1968; Moldenke, Phytologia 16: 188--189. 1968; Bolkh., Grif, Matvej., & Zakhar., Chrom. Numb. Flow. Pl. 717. 1969; A. L. Moldenke, Phytologia 18: 126. 1969; Rydb., Fl. Rocky Mtns., ed. 2, pr. 3, 739 & 740. 1969; Tidestr., Contrib. U. S. Nat. Herb. 25 [Fl. Utah & Nev.], pr. 2, 469. 1969; Rickett, Wild Fls. U. S. 3 (2): 365 (1969) and 4 (3): 540, [541], & 799, pl. 176. 1970; Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. Bot. 6:] 1876 & 1877. 1970; Moldenke in Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. Bot. 6:] 1315 & 1320. 1970; Moldenke, Fifth Summ. 1: 50, 51, 59, 62, 63, & 371 (1971) and 2: 682 & 916. 1971.

Additional & emended illustrations: Lewis & Oliv., Am. Journ. Bot. 48: 640, fig. 17. 1961; Rickett, Wild Fls. U. S. 4 (3): [541], pl. 176 [in color]. 1970.

Recent collectors have found this plant growing in forests and open woodlands, in subalpine meadows, on rocky hillsides with Pinus ponderosa and Abies concolor, and along subalpine roadsides, at altitudes up to 10,000 feet. Howell & McClintock (1960) state that in Arizona it is found mostly in pine forests from 6000 to 7000 feet altitude, blooming from June to September, while Demaree reports it as "common in rocky open wooded bottoms" in New Mexico. Andrew and Alison Moldenke have reported to me that "V. macdougalii is just as common, if not more so, at the Grand Canyon and to/from Flagstaff [Arizona], but only in weedy areas. We

haven't seen a single plant here in non-disturbed areas — none at all in 500 miles of N. Arizona and S. Utah."

Common names for the species, in addition to those previously reported by me, are "dormillon" and "Macdougal verbena". Burlage (1968) reports that "a tea of this is drunk as a diuretic [in Texas] and the green leaves are mashed and used for toothache". Hirata (1966) records the fungus, Erysiphe cichoracearum P. DC., as attacking this plant. The H. R. Bennett 8055, distributed as V. macdougalii, is actually mut. rosella Cockerell, while Johnston & Muller 877 is V. scabra Vahl.

Additional citations: COLORADO: Conejos Co.: W. A. Weber 7865a (Se--145178). NEW MEXICO: Colfax Co.: Mahler 861 (Au--248858). Lincoln Co.: W. Hess 260 (Se--226055); Tucker 3209 (Se--184025); Wooton & Standley 47452 (Ws). McKinley Co.: Baad 1076 (Se--236110). Otero Co.: Baad 798 (Se--236953); Demaree 50949 (Ac), 60788 (Rf); Iwen & Iwen 202 (Ws). San Miguel Co.: R. S. Ferris 11521 (Se--189506); Rowlett 42 (Au--254348); Studhalter & Marr S. 1836 (Lk). Taos Co.: Kempers 94 (Sd--64213). ARIZONA: Coconino Co.: G. N. Jones 21040 (Se--199522).

VERBENA MACDOUGALII f. ALBIFLORA Moldenke

Additional bibliography: Moldenke, *Phytologia* 10: 117--119. 1964; Moldenke, *Fifth Summ.* 1: 51 & 62 (1971) and 2: 916. 1971.

VERBENA MACDOUGALII mut. ROSELLA Cockerell

Additional bibliography: Moldenke, *Phytologia* 10: 118. 1964; Moldenke, *Fifth Summ.* 1: 62 (1971) and 2: 916. 1971.

Bennett encountered this plant at 7300 feet altitude in the Transition Zone, flowering in July. He describes the corolla color as "rose". It has been misidentified and distributed in some herbaria as typical V. macdougalii Heller.

Additional citations: NEW MEXICO: San Miguel Co.: H. R. Bennett 8055 (Go, W--2446278).

VERBENA MACRODONTA Perry

Additional bibliography: Moldenke, *Phytologia* 10: 118--119. 1964; Moldenke, *Fifth Summ.* 1: 76 (1971) and 2: 916. 1971.

VERBENA MACROSPERMA Speg.

Additional bibliography: Moldenke, *Phytologia* 16: 100. 1968; Moldenke, *Fifth Summ.* 1: 201 (1971) and 2: 916. 1971.

VERBENA MALMII Moldenke

Additional bibliography: Angely, *Fl. Anal. Paran.*, ed. 1, 572. 1965; Moldenke, *Phytologia* 13: 208. 1966; Moldenke, *Fifth Summ.* 1: 178 (1971) and 2: 682 & 917. 1971.

VERBENA MARITIMA Small

Additional bibliography: J. A. Clark, *Card Ind. Gen. Sp. Var.* issue 141. 1933; Greene & Blomquist, *Fls. South* 109. 1953; Molden-

ke, *Phytologia* 16: 100. 1968; Anon., *Torrey Bot. Club Ind. Am. Bot. Lit.* 3: 308. 1969; Moldenke in Menninger, *Flow. Vines* 338, ph. 284. 1970; Long & Lakela, *Fl. Trop. Fla.* 741 & 961. 1971; Moldenke, *Fifth Summ.* 1: 10 & 30 (1971) and 2: 521, 525, 653, & 917. 1971.

Additional illustrations: Greene & Blomquist, *Fls. South* 109. 1953; Moldenke in Menninger, *Flow. Vines* ph. 284. 1970.

O'Neill encountered this species in low pinelands. Greene & Blomquist (1953) call it "seaside-verbena" and describe it as "another flat-topped verbena, the only species often frequenting coastal situations of dunes, dry pinelands, and hammocks. Flowers range from rose to bright-purple. Plants spreading to widely creeping. S. peninsular of Fla."

Additional citations: FLORIDA: Brevard Co.: P. O. Schallert 20869 (Se--200558); B. Sharp s.n. [9.IV.68] (Ws). Dade Co.: O' Neill 7596 (Mi). Flagler Co.: J. K. Small s.n. [Ocean City, April 18, 1922] (Se--162929). Indian River Co.: J. K. Small s.n. [Near Sebastian, June 1928] (Ca--1216765, N). Jupiter Island: Small, Mosier, & DeWinkeler 10891 (Se--198405).

VERBENA MARRUBIODES Cham.

Additional bibliography: Angely, *Fl. Anal. Paran.*, ed. 1, 572. 1965; Moldenke, *Phytologia* 16: 100. 1968; Moldenke, *Fifth Summ.* 1: 144, 178, 190, & 201 (1971) and 2: 662, 675, & 917. 1971.

The corollas on Hatschbach 12843 are described as having been "lilac" when fresh. This same distinguished collector, on the label of his no. 17120, notes "repente, flôr lilaz, intenso; campo sêco, prefere campo esgotado e também barrancos".

Additional citations: BRAZIL: Paraná: Hatschbach 12843 (W--2564873), 17120 (Ft, N, W--2536531).

xVERBENA MATRITENSIS Moldenke

Additional bibliography: Moldenke, *Phytologia* 14: 289. 1967; Moldenke, *Fifth Summ.* 1: 372 (1971) and 2: 660, 673, & 917. 1971.

VERBENA MEGAPOTAMICA Spreng.

Additional synonymy: Glandularia megapotámica Schnack & Covas, *Revist. Argent. Agron.* 12: 224. 1945.

Additional & emended bibliography: J. A. Clark, *Card Ind. Gen. Sp. Var.* issue 185. 1944; Schnack & Covas, *Revist. Argent. Agron.* 12: 222--229, fig. 1 B & C, 2 A--C, 3 D--G, & pl. 12 A, B, E, & H. 1945; Cabrera, *Man. Fl. Alred. Buenos Aires* 397 & 398. 1953; Michalowski, *Serv. Tecn. Interam. Coop. Agr. Bol.* 169 & 175. 1954; Darlington & Wylie, *Chrom. Atl.*, pr. 1, 323. 1956; Schnack, Fehleisen, & Cocucci, *Revist. Argent. Agron.* 24: 129--135, pl. 1, A, B, E, & F, & fig. 1. 1957; Darlington & Wylie, *Chrom. Atl.*, pr. 2, 323. 1961; Angely, *Fl. Anal. Paran.*, ed. 1, 572. 1965; Troncoso in Cabrera, *Fl. Prov. Buenos Aires* 5: 133, 136, & 137, fig. 46 A & B. 1965; Moldenke, *Phytologia* 16: 189 & 196. 1968; Solbrig, Passani, & Glass, *Am. Journ. Bot.* 55: 1239. 1968; Bolkh., Grif, Matvej., & Zakhar., *Chrom. Numb. Flow. Pl.* 715. 1969;

Schnack & Rubens, Bol. Soc. Argent. Bot. 13: 205. 1970; Solbrig, Princ. & Meth. Pl. Biosystem. 76. 1970; Moldenke, Fifth Summ. 1: 178, 188, 190, 201, & 371 (1971) and 2: 521, 683, 689, 690, 694, 700, & 917. 1971; Troncoso, Darwiniana 16: [613]--616 & 621, fig. 1. 1971; Moldenke, Phytologia 23: 239. 1972.

Additional & emended illustrations: Schnack & Covas, Revist. Argent. Agron. 12: 225, fig. 1 B & C, 226, fig. 2 A--C, fig. 3 D--G, & pl. 12 A, B, E, & H. 1945; Schnack, Fehleisen, & Cocucci, Revist. Argent. Agron. 24: 131, fig. 1, & 133, pl. 1 A, B, E, & F. 1957; Troncoso in Cabrera, Fl. Prov. Buenos Aires 5: 136, fig. 46 A & B. 1965; Troncoso, Darwiniana 16: 615, fig. 3. 1971.

Schnack & Covas (1945) and Schnack & Gonzalez (1945) record the chromosome number of this taxon as $n = 10$.

Troncoso (1965) cites from Buenos Aires only Burkart 7077 and Cabrera 3401 and gives the distribution of the species as "Sur del Brasil, Uruguay y litoral argentino. Habita en albardones altos y matorrales del Delta y Punta Lara." Schnack & Rubens (1970) record it also from Corrientes, Argentina. The corollas on Boffa s.n. [Herb. Inst. Miguel Lillo 148] are said to have been "lilac" in color. The T. Rojas 2111 and Herb. Inst. Miguel Lillo 107893, distributed as V. megapotamica, are actually V. incisa Hook.

Troncoso (1971), in a recent very splendid paper, reviews the history of this species nomenclaturally and critically compares three closely related taxa, separating them as follows:

- "A. Hierbas o sufrútices subglabros y lisos, con pelitos estrigosos en tallos y hojas. Cáliz raramente estrigoso, pelitos antrorsos apretados a la superficie y por lo general con glándulas subsésiles, pateriformes, antociáncias, sobre las costillas. Brácteas oval-oblongas o lanceolado-subuladas, ciliadas, de 2--5 mm long.....G. megapotamica.
- A'. Hierbas o sufrútices áspero-hirsútulos, con pubescencia variada simple y glandulosa en tallos y hojas. Cáliz ya sea con pelos largos patentes y pelitos rígidos más breves, o bien densamente cano-retrorso-pubescente, en ambos casos por lo general con pelitos glandulares estipitados entremezclados. Brácteas ovales o lanceoladas, pubescentes o pestafiosas.
- B. Brácteas lanceoladas, de unos 5 mm long., pestafiosas, por lo demás subglabras. Tubo corolar de 16--18 mm long. Hojas oval-oblongas, brevemente cuneadas en la base, hipofilo cano-hispido sobre los nervios, reticulado hirsútulo por breves pelitos derechos, rígidos. Cáliz con pelos largos patentes, pelitos subrígidos breves y pelitos glandulares estipitados. Mericarpios de 3,5--4,5 mm. long.....G. phlogiflora.
- B'. Brácteas ovales u oval-lanceoladas de 1--2 mm long., hispido-pubescentes principalmente en la base y bordes. Tubo corolar de 19--22 mm long. Hojas oblongo o triangular-lanceoladas, subtruncadas o brevemente cuneadas en la base, hipofilo hirsútulo. Cáliz densamente cano-pubes-

cente, pubescencia por lo general retrorso, y pocos pelos glandulares estipitados entremezclados. Mericarpios de 5--6 mm long.....G. guaranitica."

She gives its distribution as "Sur del Brasil, Uruguay y NE de la Argentina hasta las barrancas del Río de la Plata. Habita en pajonales y albardones altos de las islas del Delta." She cites the following specimens: BRAZIL: Rio Grande do Sul: Isabelle s.n. [1835] (K); Sellow s.n. (K, V). URUGUAY: Osten 5389 (Si); Sellow 3162 (K). ARGENTINA: Buenos Aires: Boffa 148 (Si); A. Burkart 7019 (Si), 22403 (Si--983, Si--16063); Lanfranchi 496 (Si). Entre Ríos: A. Burkart 5127 (Si), 8293 (Si), 15134 (Si), 27055 (Si); Boelke 915; Hunziker 4625.

Additional citations: ARGENTINA: Buenos Aires: Boffa s.n. [Herb. Inst. Miguel Lillo 148] (N); A. Burkart 22403 (W--2567980).

VERBENA MENDOCINA R. A. Phil.

Additional & emended bibliography: Reiche & Phil., Fl. Chil. 5: 295 & 463. 1910; J. A. Clark, Card Ind. Gen. Sp. Var. issue 184. 1944; Darlington & Wylie, Chrom. Atl., pr. 1, 323. 1956; J. F. Macbr., Field Mus. Publ. Bot. 13 (5): 629. 1960; Darlington & Wylie, Chrom. Atl., pr. 2, 323. 1961; Troncoso in Böcher, Hjerting, & Rahn, Dansk Bot. Arkiv 22 (1): 109. 1963; Hocking, Excerpt. Bot. A.10: 270. 1966; Moldenke, Phytologia 16: 189. 1968; Bolkh., Grif, Matvej., & Zakhar., Chrom. Numb. Flow. Pl. 715 & 717. 1969; Moldenke, Fifth Summ. 1: 190, 201, & 371 (1971) and 2: 521, 683, 688, & 917. 1971.

Troncoso (1963) cites Böcher, Hjerting, & Rahn 2070, collected at an altitude of 1650 meters. Beetle (1943) classifies this species in the Cruciferae, doubtless through some stenographic error. He reports that Macloskie is of the opinion that Patagonia depends on constant replenishment of its flora from the Andean mountain chain; Neger suggests that the river courses are probably the migratory lanes for the entrance of such plants as Verbena mendocina.

VERBENA MENTHAEFOLIA Benth.

Additional bibliography: Abrams, Illustr. Fl. Pacif. States, pr. 1, 3: 610, 611, & 616, fig. 4343. 1951; Howell & McClintock in Kearney & Peebles, Ariz. Fl., ed. 2, 726 & 728. 1960; Ferris in Abrams & Ferris, Illustr. Fl. Pacif. States, pr. 1, 4: 651 & 730 (1960) and pr. 2, 4: 651 & 730. 1965; Abrams, Illustr. Fl. Pacif. States, pr. 2, 3: 610, 611, & 616, fig. 4343. 1967; Moldenke, Phytologia 16: 100--101. 1968; Munz & Keck, Calif. Fl. 686, 687, & 1679. 1968; Rickett, Wild Fls. U. S. 3 (2): 364 (1969) and 4 (3): 540 & 799. 1970; Gibson, Fieldiana Bot. 24 (9): 230 & 233. 1970; Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. Bot. 6:] 1876 & 1877. 1970; Moldenke in Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. Bot. 6:] 1314 & 1318. 1970; Moldenke, Fifth Summ. 1: 59, 63, 66, 76, 81, 206, & 371 (1971) and 2: 674, 682, 683, 686, 687, 695, 697, & 917. 1971; Moldenke, Phytologia 22: 473 & 499 (1972) and 23: 184 & 188. 1972.

Additional illustrations: Abrams, *Illustr. Fl. Pacif. States*, pr. 1, 3: 616, fig. 4343 (1951) and pr. 2, 3: 616, fig. 4343. 1967.

Recent collectors have found this plant growing in pastizal, matorral, Opuntia matorral, woods, oak or pine and oak woods, cultivated ground and old cultivated fields, on slopes with pine-oak woods, on grassy banks and low banks near water, and at the edge of lakes, flowering (in addition to the months previously reported by me) and fruiting in November. González Quintero found it in shrubby matorral of Juniperus in Hidalgo, Mexico, while in the same state Mears reports it growing in association with Cassia, Cuphea, Indigofera, Juniperus, Mimosa, Phoradendron, Quercus, and Teucrium. In Zacatecas it was encountered in well-drained soil in full sun on a level plateau with microphyll desert scrub of the Prosopis-Acacia association by Detling. Breedlove describes it as a suffrutescent perennial growing under shrubs on tablelands heavily covered with shrubs in Sonora, while he and Kawahara found it on slopes with Arbutus xalapensis, Quercus epileuca, Q. urbani, Pinus ayacahuite, and P. lumholzii in Sinaloa. Cruz C. and Vargas N. came upon it on "ladera basáltica con vegetación de matorral de Acacia y Opuntia" in México and in "terrenos fangosos" in Hidalgo. In the state of México, also, Morales Díaz found it on "ladera andesítica con vegetación secundaria" and Rico A. in "encinar abierto y pastizales". An additional vernacular name variant is "telran".

The corolla is described as having been "very faint purple" on Hinton 11991, "red-purple" on Lagunas & Castillo 17, "purple" on Rico A. 31, J. Rzedowski 1088, 20302, & 22205a, "violet" on Franco R. s.n. and García Saucedo s.n., "pale-lavender" on Dieterle 3574, "blue" on Breedlove 1498, and "pale-blue" on Breedlove & Kawahara 16815.

Pennington reports that in Chihuahua and Sonora the entire plant is boiled in preparing a tea for use by the natives against stomach disorders and to stop vomiting, and also that goats browse upon the plant.

Howell & McClintock (1960) cite Jones s.n. [near Yuma, 1906]. Material has been misidentified and distributed in some herbaria under the names V. bipinnatifida var. latilobata Perry, "V. neomexicana (A. Gray) Small", and V. pinetorum Moldenke. The J. Rzedowski 22205a, cited below, is a mixture with V. ciliata Benth., while Franco R. s.n. [20.VIII.1967], García Romero s.n. [11/VIII/1968], and Márquez s.n. [23/VII/1962] are mixtures with V. carolina L. The R. Pearce 2276, distributed as V. menthaefolia, is actually V. halei Small, while Pinkava, Keil, & Lehto 14553 is V. neomexicana var. xylopoda Perry.

Additional citations: MEXICO: Baja California: Mrs. F. Wylie s.n. [April 8, 1950] (Sd--43915). Chihuahua: Kruckeberg 4928 (Se--207495); Pennington 43 (Au--287715); Stuessy 990 (Au--257464). Federal District: Huerta M. 42 (Ip); Márquez s.n. [23/

VII/1962] (Ip); J. Rzedowski 1088 (Au—241215, Ip); Villegas D. 80 (Ip), 550 (Ip). Hidalgo: Chávez O. s.n. [4.VIII.1963] (Ip); Cruz C. 407 (Ac); García Saucedo s.n. [10.IX.1966] (Ip); González Quintero 257 (Ip), 304 (Ip), 931 (Ip), 994 (Ac), 1265 (Ip), 2590 (Ip), 2882 (Ip, Mi); Lagunas & Castillo 17 (Ip); Wears 259a (Au—255097), 326a (Au—254967). Jalisco: J. V. A. Dieterle 3574 (Mi). México: Cruz C. 564 (Mi); Franco R. s.n. [20.VIII.1967] (Ip); Morales Díaz s.n. [22/VII/1962] (Ip); Rebolledo Vélez s.n. [20.VIII.1967] (Ip); Rico A. 31 (Rf); J. Rzedowski 20302 (Rf), 22205a, in part (Ip), 22207a (Ip), 24086 (Ip); Vargas N. s.n. [24.IV.1966] (Ip). Michoacán: García Romero s.n. [11.VIII.1968] (Ip); Hinton 11991 (Mi, Se—117442). Sinaloa: Breedlove & Kawahara 16815 (Rf). Sonora: Breedlove 1498 (Au—232106); Pennington 66 (Au—287642), 98 (Au—287612). Veracruz: Dodds 91 (N). Zaca-tecas: Detling 9436 1/2 (Ip). State undetermined: J. Rzedowski 1133 [La Candelaria] (Ip).

xVERBENA MERETRIX Moldenke

Additional bibliography: Moldenke, *Phytologia* 11: 472. 1965; Moldenke, *Fifth Summ.* 1: 371 (1971) and 2: 674, 686, & 917. 1971.

VERBENA MICROPHYLLA H.B.K.

Emended synonymy: Verbena microphylla Humb. & Bonpl. ex Steud., *Nom. Bot. Phan.*, ed. 1, 873. 1821. Glandularia microphylla (H.B.K.) Cabrera, *Revist. Invest. Agríc.* 11: 398. 1958.

Additional bibliography: Cabrera, *Revist. Invest. Agríc.* 11: 332 & 398. 1957; Cabrera, *Bol. Soc. Argent. Bot.* 7: 150. 1958; J. A. Clark, *Card Ind. Gen. Sp. Var.* issue 228. 1958; J. F. Macbr., *Field Mus. Publ. Bot.* 13 (5): 614 & 625—626. 1960; Troncoso in Böcher, Hjerting, & Rahn, *Dansk Bot. Arkiv* 22 (1): 109. 1963; Meyer & Weyrauch, *Inst. Mig. Lill. Misc.* 23: 33 & 123. 1966; G. Taylor, *Ind. Kew. Suppl.* 13: 61. 1966; Moldenke, *Phytologia* 16: 101 & 206. 1968; Schnack & Rubens, *Bol. Soc. Argent. Bot.* 13: 205. 1970; Moldenke, *Fifth Summ.* 1: 137, 144, 184, 190, 193, & 201 (1971) and 2: 521, 541, 678, 684, & 917. 1971; Moldenke, *Phytologia* 23: 199. 1972.

Recent collectors have encountered this plant on grazed grassy paramos. Macbride (1960) comments that the species is "Scarcely more than a part of V. laciniata (L.) Briq. but perhaps recognizable and apparently a high Andean state; listed by Ball as 'V. diffusa Willd.'" He gives its extra-Peruvian distribution as "To Uruguay and Ecuador" and cites the following collections from Peru: Ancash: Macbride 171, Weberbauer 3042. Ayacucho: Ferreyra 5509. Cuzco: Vargas 9827. Lima: Ball s.n., Ferreyra 3531, Macbride 169, Weberbauer 226. Puno: Pennell 13359, J. Sharpe 58, Soukup 70 & 870. Troncoso (1963) cites Kurtz 108.

The Cabrera (1957) reference cited above is sometimes cited as "1958", but is plainly dated "1957" in the original.

[to be continued]

A NEW COMBINATION IN THE GENUS EUTHAMIA

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Euthamia hirtipes (Fernald) Sieren comb. nov. was first named by M. L. Fernald (1946) from specimens collected in Sussex Co., Virginia. Fernald included the new species in the genus Solidago and proposed it to be the result of hybridization between S. graminifolia (L.) Salisb. var. nuttallii (Greene) Fernald and S. microcephala (Greene) Bush inasmuch as the specimens were morphologically intermediate between the two and the ranges of the proposed parents would allow it. Since then, several specimens have been collected from along the coasts of the Carolinas which bear a strong resemblance to the photo and description of the type in Fernald's paper. Because the name S. hirtipes has generally been overlooked, however, the more recent collections have usually been referred to either S. leptoccephala T. & G. or S. tenuifolia Pursh, both of which are closely allied to S. hirtipes. S. leptoccephala is a species of the lower Mississippi valley extending from western Tennessee and Kentucky west to Texas while S. tenuifolia [including S. microcephala (Greene) Bush] is a narrower-leaved species also found along the coast, but extending from Louisiana to Florida north to New England. The species group (Solidago section Euthamia) to which S. hirtipes belongs has often been considered to constitute a separate genus Euthamia (Nuttall, 1840; Greene, 1902; Shinners, 1951). That treatment is accepted by this author as the more natural one and for annotation purposes therefore the new combination becomes necessary.

Literature Cited

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- Greene, E. L. 1902. A study of Euthamia. Pittonia 5: 72-80.
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- Shinners, L. H. 1951. The Texas species of Euthamia (Compositae). Field and Lab. 19: 137-138.

STUDIES IN THE EUPATORIEAE (ASTERACEAE). LXVII.

GRAZIELIA NOM. NOV. FOR DIMORPHOLEPIS

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A second example of a homonym among the recently named genera of the Eupatorieae has been called to our attention by Dr. Max Gray of Australia. The name Dimorpholepis (Barroso) R.M.King & H.Robinson (1971a) is preoccupied at the generic level by Dimorpholepis A. Gray an Australian plant now placed in the genus Helipterum DC. The two later homonyms that we produced at nearly the same time, Neobartlettia and Dimorpholepis, are particularly regrettable because of the ease with which they could seemingly have been avoided. Almost every other phase of the present series of studies is more difficult including the search for an increasing number of new and appropriate names. Here is not so much the failure to check as the failure to make it a practice to check many times. Both of these names we did think we had checked while obviously we had not.

The new name that we propose for Dimorpholepis (Barroso) R.M.King & H.Robinson is Grazielia, honoring again Dr. Graziela Maciel Barroso, the leading authority on Brazilian Compositae.

Grazielia R.M.King & H.Robinson, nom nov. for Dimorpholepis (Barroso) R.M.King & H.Robinson, Phytologia 22: 118-120. 1971.

Type species: Eupatorium dimorpholepis Baker.

Our studies of the genus indicate that it contains the following nine species.

Grazielia anethifolia (A.P.Decandolle) R.M.King & H.Robinson, comb. nov. Eupatorium anethifolium A.P.Decandolle, Prodr. 5: 182. 1836. Brazil.

Grazielia coriacea (Scheele) R.M.King & H.Robinson, comb. nov. Eupatorium coriaceum Scheele, Linnaea 18: 457. 1844. Brazil.

Grazielia dimorpholepis (Baker) R.M.King & H.Robinson,
comb. nov. Eupatorium dimorpholepis Baker, Mart.
Fl. Bras. 6(2): 331. 1876. Brazil.

Grazielia gaudichaudiana (A.P.Decandolle) R.M.King &
H.Robinson, comb. nov. Eupatorium gaudichaudianum
A.P.Decandolle, Prodr. 5: 148. 1836. Brazil.

Grazielia intermedia (A.P.Decandolle) R.M.King &
H.Robinson, comb. nov. Eupatorium intermedium
A.P.Decandolle, Prodr. 5: 148. 1836. Brazil.

Grazielia mollissima (Sch.-Bip. ex Baker) R.M.King &
H.Robinson, comb. nov. Eupatorium mollissimum
Sch.-Bip. ex Baker, Mart. Fl. Bras. 6(2): 331.
1876. Brazil.

Grazielia multifida (A.P.Decandolle) R.M.King & H.
Robinson, comb. nov. Eupatorium multifidum
A.P.Decandolle, Prodr. 5: 182. 1836. Brazil.

Grazielia nummularia (Hook. & Arn.) R.M.King & H.
Robinson, comb. nov. Eupatorium nummularia
Hook. & Arn., Hook. Comp. Bot. Mag. 1: 241.
1835. Brazil.

Grazielia serrata (Spreng.) R.M.King & H.Robinson,
comb. nov. Eupatorium serratum Spreng., Syst.
3: 415. 1826. Argentina, Brazil, Uruguay.

Reference

King, R.M. & H.Robinson 1971. Studies in the
Eupatorieae (Asteraceae). LV. The genus,
Dimorpholepis. Phytologia 22: 118-120.

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STUDIES IN THE EUPATORIEAE (ASTERACEAE). LXVIII.

A NEW GENUS, CONOCLINIOPSIS

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The genus we name here as Conocliniopsis is based on a single species distributed widely in South America from Colombia to southern Brazil. The species is most closely related to the genus Barrosoa but differs most prominently by the densely setiferous achene and the extremely high conical receptacle. In addition to the technical differences between Conocliniopsis and Barrosoa, the former single species has a distribution which includes the entire range of all the species of the latter and there is every reason to believe that the two genera have a long distinct evolutionary history.

The species that we place here in Conocliniopsis is very distinct and well known to all students of the Asteraceae of South America, but the name Eupatorium ballotaefolium H.B.K. usually applied to the species is incorrect. In a note on Eupatorium ballotaefolium, B. L. Robinson (1918) mentioned some phyllary characters of typical material and he named a new variety. The two varieties recognized by B. L. Robinson actually differ by far more than phyllary characters. Typical E. ballotaefolium has phyllaries more blunt and less pubescent, the backs of the corolla lobes covered with short hairs, the achenes nearly glabrous and extremely constricted below the pappus, the carpopodium stopper shaped with small cells and without setae on the upper rim, and the receptacle is plain. True Eupatorium ballotaefolium, in fact, is a Lourtegia which differs from the description of that genus (King & Robinson, 1971) only by the larger number of flowers per head (up to 40). The Eupatorium ballotaefolium var. caucense B. L. Robinson with phyllaries more pointed and hirsute, with backs of the corolla lobes lacking hairs, with the achenes densely setiferous without a constriction above, with a carpopodium broad with setae on the upper rim and a high conical receptacle; is the same plant previously described as Conoclinium prasiifolium A.P. Decandolle and which we place here in Conocliniopsis. The South American

material recognized in present treatments under the name Eupatorium ballotaefolium H.B.K. should be placed in the following two taxa.

Lourteigia ballotaefolia (H.B.K.) R.M.King & H.Robinson, comb. nov. Eupatorium ballotaefolium H.B.K., Nov. Gen. et Sp. 4: 95. 1818. Ed. Folio. Colombia.

Conocliniopsis R.M.King and H.Robinson, genus novum Asteracearum (Eupatorieae). Plantae herbaceae erectae paucè ramosae. Caules teretes. Folia opposita vel ex parte alterna distincte petiolata, laminis ovatis margine crenulatis. Inflorescentiae dense corymbosae paniculatae vel cymosae. Involucri squamae eximbricatae 12-16 subaequilongae hirsutae et glanduliferae; receptacula alte conica glabra. Flores 20-30 in capitulo; corollae anguste infundibulares 5-lobatae extus glanduliferae intus glabrae, cellulis angustis parietibus sinuosis, lobis aequilateraliter triangularibus vel longioribus extus ad apicem papillosis intus mamillosis vel sublaevibus; filamenta antherarum in parte superiore angusta, cellulis plerumque elongatis, parietibus annulate ornatis, cellulis exothecialibus subquadratis, appendicibus antherarum ovatis; styli inferne non incrassati glabri, appendicibus linearibus breviter papillosis; achaenia prismatica 4-5-costata valde setifera; carpodia valde distincta breviter, superne valde setifera, cellulis subquadratis inflatis, parietibus parum incrassatis; pappus setiformis uniseriatus, setis 30-35 scabris ad apicem tenuibus, cellulis apicalibus acutis vel subacutis.

Species typica: Conoclinium prasiifolium A.P. Decandolle.

The genus is monotypic.

Conocliniopsis prasiifolia (A.P.Decandolle) R.M.King & H.Robinson, comb. nov. Conoclinium prasiifolium A.P.Decandolle, Deless. Ic. Sel 4: t 15. 1840. Eupatorium ballotaefolium H.B.K. var. caucense B.L.Robinson, Contr. Gray Herb. n.s. 55: 237. 1918. Colombia, Venezuela, Brazil.

References

King, R.M. & H.Robinson. 1971. Studies in the Eupatorieae (Compositae). XXXV. A new genus,

1972 King & Robinson, A new genus, Conocliniopsis 309
Lourteigia. Phytologia 21:28-30.

Robinson, B.L. 1918. Diagnoses and notes relating to
tropical American Eupatorieae. Contr. Gray Herb.
55: 235-263.

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STUDIES IN THE EUPATORIEAE (ASTERACEAE). LXIX.

A NEW GENUS, GYPTIDIUM.

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Among the Gyptoid species in eastern South America are three with the corollas extremely long and narrow in the basal part. One of these species we have already covered in our treatment of the genus Urolepis (King & Robinson, 1971). The other two species treated here seem related to Urolepis by the form of the corolla and by the blunt cells at the tips of the pappus setae, among other features. These species lack two features that are very prominent in Urolepis, however, the extremely long papillae on the stylar appendage and the large carpodium with large thin-walled cells. The corolla lobes of the two species are also slightly to strongly papillose while those of Urolepis are essentially smooth. A final distinction of Urolepis is the greatly expanded receptacles bearing 100-150 flowers.

On the basis of the characters given above we recognize here the genus Gyptidium with two species. Still, the two species have notable differences. Gyptidium militare has a paleaceous receptacle and rather poorly developed apical cells on the pappus setae, while G. trichobasis has only hairs on the receptacle as in Urolepis and has very enlarged cells on the tips of the pappus setae.

As presently known the genus Gyptidium is restricted to southern Brazil and adjacent Argentina.

Gyptidium R.M.King & H.Robinson, genus novum
Asteracearum (Eupatorieae). Plantae herbaceae erectae
raro ramosae. Caules teretes striati. Folia opposita
vel ex parte alterna distincte petiolata, laminis
ovatis vel lanceolatis basi truncatis margine crenu-
latis. Inflorescentiae corymboso-paniculatae vel
cymosae. Involucri squamae subimbricatae vel
eximbricatae ca. 25 subaequilongae alte glanduliferae;
receptacula conica hirsuta vel ubique anguste pale-
ifera. Flores 50-80 in capitulo; corollae inferne
perangustatae superne anguste campanulatae 5-lobatae
extus glanduliferae intus glabrae, cellulis angustis

parietibus sinuosis, lobis aequilateraliter triangul-
aribus vel longioribus extus ad apicem papillosis
intus sublaevibus vel papillosis; filamenta anther-
arum in parte superiore angusta, cellulis infernis
plerumque quadratis, parietibus annulate ornatis,
cellulis exothecialibus subquadratis, appendicibus
antherarum ovatis; styli inferne non incrassati
glabri, appendicibus linearibus valde dense papillosis;
achaeia prismatica 4-5-costata glandulifera; carpo-
podia obsoleta; pappus setiformis uniseriatus, setis
25-35 scabris cellulis apicalibus obtusis plerumque
dilatatis.

Species typica: Eupatorium militare B.L.Robinson

Our studies of the genus indicate that it con-
tains two species.

Gyptidium militare (B.L.Robinson) R.M.King & H.Rob-
inson, comb. nov. Eupatorium militare B.L.Rob-
inson, Contr. Gray Herb. n.s. 65: 50. 1922.
Argentina.

Gyptidium trichobasis (Baker) R.M.King & H.Robinson,,
comb. nov. Eupatorium trichobasis Baker, Mart.
Fl. Bras. 6(2): 364. 1876. Brazil.

Reference

King, R.M. & H.Robinson. 1971 Studies in the Eupator-
ieae (Asteraceae). XL. The genus, Urolepis.
Phytologia 21: 304-305.

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STUDIES IN THE EUPATORIEAE (ASTERACEAE). LXX.

A NEW GENUS, BAHIANTHUS.

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The state of Bahia in northeastern Brazil is noted for its distinctive flora. Of the many endemic Eupatorieae, certain species of Agrianthus and Stylo-trichium are perhaps the best known. Careful investigation has shown that another eupatorian endemic represents a distinct genus which we name here after the state of Bahia.

The single species Bahianthus viscosus has a synonymy unusually representative of the generic chaos that has prevailed in the Eupatorieae. The species has been placed in Mikania, Kuhnia, Gyptis and Symphypappus, only recently being placed in Eupatorium, (Steyermark, 1953) the genus where its closest relatives have long resided. The species is strikingly similar in vegetative aspect to the genus Symphypappus and a relationship is impossible to ignore, but Bahianthus has an irregular flower number ranging from 15-22, papillose corolla lobes, and has a conical receptacle, three characteristics not found in the Disynaphioid complex to which Symphypappus belongs. Bahianthus actually seems most closely related to Barrosoa in the Gyptoid complex which also has the achenes with glands but no setae on the sides and the carpopodia with large thin-walled cells. The new genus differs from Barrosoa in its vegetative appearance with glabrous obovate leaves and also in the details of the style branches which are dilated at the tips and densely papillose. Bahianthus can also be distinguished by the very thick base on the corolla, the large cells of the corolla lobes, the slightly larger than usual pollen with unusually long spines and the coarser more irregular pappus setae.

Bahianthus R.M.King and H.Robinson, genus novum
Asteracearum (Eupatorieae). Plantae herbaceae vel
frutescentes erectae paucè ramosae. Caules teretes
striati. Folia alterna distincte petiolata, glabra,
laminis coriaceis obovatis basi cuneatis ad apicem
obtusis serrulatis. Inflorescentiae corymboso-panic-

ulatae; pedicelli glabri striati. Involucri squamae 18-20 subimbricata fere glabra; receptacula conica glabra. Flores 15-22 in capitulo; corollae tubulares carnosae 5-lobatae extus inferne glabrae intus glabrae, cellulis oblongis parietibus interioribus sinuosis, lobis aequilateraliter triangularibus vel longioribus extus glanduliferis superne papillois intus mamillosis; filamenta antherarum in parte superiore lata, cellulis plerumque quadratis parietibus annulate vel intricate ornatis, cellulis exothecialibus subquadratis, appendicibus antherarum ovatis; styli inferne non incrassati glabri, appendicibus elongatis ad apicem parum dilatatis dense erecte papillois; achaenia prismatica 4-5-costata parce glandulifera, punctis saepe in seriebus transversis, costis in parte inferiore callosis; carpopodia distincte incrassata, cellulis quadratis inflatis, parietibus tenuibus; pappus setiformis uniseriatus, setis ca. 30 breviter ciliato-dentatis, dentibus inferioribus irregulariter dispositis superioribus congestis, cellulis apicalibus angustis obtusis.

Species typica: Mikania viscosa Spreng.

The genus is monotypic.

Bahianthus viscosus (Spreng.) R.M.King & H.Robinson, comb. nov. Mikania viscosa Spreng. Neue Entdeck.. 1: 277. 1820. Kuhnia baccharoides A.P.Decandolle, Prodr. 5: 128. 1836. Gyptis baccharoides Schultzbip. Mss in herb. Symphyopappus viscosus Schultzbip. ex Baker, Mart. Fl. Bras. 6(2):366. 1876. Eupatorium harvardianum Steyermark, Fieldiana: Botany 28:636. 1953.

Reference

Steyermark, J.A. 1953. Botanical Exploration in Venezeula. Fieldiana: Botany 28(3):636.

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FIVE MORE VERBENACEOUS NOVELTIES

Harold N. Moldenke

AEGIPHILA GLORIOSA var. PARAËNSIS Moldenke, var. nov.

Haec varietas a forma typica speciei pilis ubique multo brevioribus minore divaricatis recedit.

This variety differs from the typical form of the species in having its pubescence throughout much shorter and far less conspicuously divaricate-spreading.

The type of the variety was collected by M. Silva and R. Souza (no. 2253) in woods on terra firme from Ramal to Novo Imperio, at km. 35 on the road to Palhão, Santamém, Pará, Brazil, on August 14, 1969, and is deposited in my personal herbarium at Plainfield, New Jersey. The collectors describe the plant as a shrub, 3 meters tall, with yellow flowers. It has much the overall appearance of A. racemosa Vell.

AEGIPHILA MICROCALYCINA Moldenke, sp. nov.

Frutex scandens; ramulis junioribus gracillimis densissime adpresseque puberulentibus, pilis antrorso-strigosis; internodiis elongatis; foliis decussato-oppositis; petiolis gracillimis brevissimis densissime adpresseque puberulentibus; laminis foliorum membranaceis ellipticis vel lanceolatis supra glaberrimis nitidisque, subtus in reticulo venarum adpresso-puberulentibus, caetero subglabratissimis punctulatis, ad apicem acuminatis, ad basin abrupte acutis; inflorescentiis axillaribus terminalibusque multifloris laxis, ramulis densissime adpresso-puberulis; calyce parvo patente-campanulato parce strigilloso margine 4-dentato; corollae tubo pergracillimo glaberrimo.

Woody vine, the uppermost branchlets apparently very slender, very densely appressed-puberulent with strigose russet-brownish subantrorsely oriented hairs; principal uppermost internodes much elongated, 2.5--6 cm. long, the nodes flattened and somewhat ampliate; leaves decussate-opposite, numerous, decreasing in size toward the tips of the branchlets and among the inflorescences; petioles very slender, 3--8 mm. long, very densely appressed-puberulent with russet-brown antrorsely strigose very short hair; leaf-blades elliptic or somewhat lanceolate, 6--12 cm. long, 2--5 cm. wide, acuminate at the apex, abruptly acute at the base, completely glabrous and very shiny above, glabrous or subglabrate and shiny beneath except for the densely strigose-puberulent larger venation, densely punctulate between the veins, the midrib and the approximately 6 pairs of arcuate-ascending secondaries very slender, the latter arcuately joined in many loops at the margins; inflorescence abundant, axillary and terminal, at the tips of the youngest branchlets, more or less pyramidal, rather foliose, the peduncles, sympodia, and pedicels very slender and very densely strigose-puberulent with antrorsely appressed russet-brown hairs; bracts rather few, the lowermost foliaceous, the up-

per linear-spatulate and densely appressed-strigose; calyx broadly campanulate, relatively small, 1 mm. long, 2 mm. wide, extending far beyond the corolla-tube on both sides, very sparsely scattered-pilose, apparently herbaceous, the rim plainly 4-dentate; corolla cream-colored, very distinctly hypoc crateriform, the tube very slender, about 5 mm. long, less than 0.5 mm. wide except at the ampliate apex, completely glabrous and shiny on the outer surface, the limb completely glabrous, the lobes 4, oblong-lingulate, wide-spreading in anthesis, about 2 mm. long and 1 mm. wide, subacute or obtuse at the apex; filaments long-exserted, white, projecting 6--8 mm. beyond the corolla-tube.

The type of this very distinct species was collected by G. T. Prance, W. C. Steward, E. P. Harter, J. F. Ramos, W. S. Pinheiro, and O. P. Monteiro (no. 10907) at the margin of the Uaicá airstrip, Rio Uraricoeira, at 3°33' N., 63°11' W., Roraima, Brazil, on March 12, 1971, and is deposited in my personal herbarium at Plainfield, New Jersey. Superficially this species greatly resembles A. vitelliniflora Klotzsch, but its calyx characters at once distinguish it with ease.

CLERODENDRUM KLEMEI var. PUBERULUM Moldenke, var. nov.

Haec varietas a forma typica speciei inflorescentibus dense puberulentibus recedit.

This variety differs from the typical form of the species in having the inflorescences, including the peduncles, sympodia, pedicels, calyxes during anthesis, and outer surface of the corolla-tubes, densely puberulent.

The type of the variety was collected by Maximo Ramos [Herb. Philip. Bur. Sci. 7251] in the province of Abra, Luzon, Philippines, in January or February of 1909, and is deposited in the United States National Herbarium at Washington. The general appearance of the inflorescence is much like that seen in C. quadriloculare (Blanco) Merr. or C. mindorense Merr., but the calyx-lobes are quite different.

CLERODENDRUM MINAHASSAE var. GRANDICALYX Moldenke, var. nov.

Haec varietas a forma typica speciei calycis floriferis 4 cm. longis 8--10 mm. latis et tubo corollae 11 cm. longo recedit.

This variety differs from the typical form of the species in having its calyx during anthesis 4 cm. long and only 8--10 mm. wide and the corolla-tube 11 cm. long.

The type of the variety was collected by Chester A. Wenzel (no. 261) on the island of Leyte, Philippines, sometime in 1913, and is deposited in the United States National Herbarium at Washington.

VITEX TRIFLORA var. HIRSUTA Moldenke, var. nov.

Haec varietas a forma typica speciei pedicellis tuboque calycis lobisque calycis patente hirsutis recedit.

This variety differs from the typical form of the species in having its pedicels, calyx-tubes, and calyx-lobes conspicuously

rather long-hirsute with brown and distinctly wide-spreading hairs.

The type of the variety was collected by P. J. M. Maas, K. Kubitcki, W. C. Steward, J. F. Ramos, W. S. Pinheiro, and J. F. Lima (no. P.13120) in a forest on terra firme at Aldeota, between Porangaba and Papagaio, Rio Juruá-Mirim, Cruzeiro do Sul, along the Rio Juruá and/or Rio Moa, Acre, Brazil, on May 18, 1971, and is deposited in my personal herbarium at Plainfield, New Jersey. The collector describes the plant as a tree, 4 meters tall, with pale-blue flowers.

- - - - -

BOOK REVIEWS

Alma L. Moldenke

"INSECT RESISTANCE IN CROP PLANTS" by Reginald H. Painter, 2nd edition, xi & 520 pp., illus., University of Kansas Press, London & Lawrence, Kansas 66044. 1968. 40 sh. or \$4.75 paperback.

The first edition of this very fine work appeared in 1951 and recently has become scarce as the proverbial "hens' teeth". Yet this field of study has only grown in importance because of increasing food needs of our increasing population, because of increasing insecticide immunity, and because of the growing awareness of the serious wide-spread havoc upon the ecosystem caused by the excessive use of non-biodegradable insecticides.

The format and content are basically the same. They deal with the mechanisms of resistance, the factors affecting the expression or the permanence of resistance, the resistance to insects in wheat, corn, cotton, sorghums and potatoes, and the methods and problems in breeding for resistance. There is a topically arranged bibliography which was one of the treasures of the first edition. Little has been added to this new edition to bring it up to date.

The preface to this new paper-bound edition closes with this orientation: "In contrast to the use of insecticides, where results are sudden and there is decreasing effectiveness until re-applied, insect-resistant varieties are more permanent and cumulative in effectiveness. This is especially true of low levels of insect resistance, which have not received the attention they deserve. The use of insect-resistant varieties should be of increasing value around the world in the coming development of integrated insect control."

"HAWAIIAN HERBS OF MEDICINAL VALUE" - Found Among the Mountains and Elsewhere in the Hawaiian Islands, and Known to the

Hawaiians to Possess Curative and Palliative Properties Most Effective in Removing Physical Ailments, by H. F. Bergman and the Territorial Board of Health, 74 pp., facsimile reprint by Charles E. Tuttle Co., Tokyo, Japan & Rutland, Vermont 05701. 1972. \$3.00 paperback.

This work was first published in 1922, has long been out of print, and is now reprinted "in the interest of cultural research". Almost 200 plants are listed alphabetically by the Hawaiian names, are then described as to their curative effects and localities, and are given their scientific names where known.

Since this is a facsimile reprinting the original spelling errors persist for Chenopodium, Cibotium, Pittosporum, Colocasia and Ipomoea. For manawanawa the correct (oldest) scientific name in the varietal category is Vitex trifolia var. simplicifolia Cham.

The material makes interesting reading.

"DRAWINGS OF BRITISH PLANTS" Being Illustrations of the Species of Flowering Plants Growing Naturally in the British Isles, by Stella Ross-Craig, 109 pp., illus., G. Bell & Sons, Ltd., London W.C.2. 1971. £1.00.

This is Part XXVIII of the series, comprising 53 beautifully accurate plates illustrating members of the Hydrocharitaceae and the Orchidaceae. There is an index of these plants included.

"COMMON WEEDS OF THE UNITED STATES" prepared by the Agricultural Research Service of the United States Department of Agriculture, 463 pp., illus., Dover Publications, Inc., New York, N. Y. 10014. 1971. \$4.50.

This is an unaltered replication of "Selected Weeds of the United States" originally published by the Government Printing Office for the United States Department of Agriculture in 1970. The clear text and the fine geographic distribution maps are the careful work of the botanist, Clyde F. Reed, and the excellently accurate and lifelike drawings are the skilled work of the scientific illustrator, Regina O. Hughes.

It is good to have this helpful and attractive book easily available at a very reasonable price.

The printing is easily legible. Only the varietal name, pinatifidum, on p. 389 was noticed as being misspelled.

Comparison with H. N. Moldenke's recent (1971) "Fifth Summary of the Verbenaceae, Avicenniaceae, Stilbaceae, Dicrasyllidaceae, Symphoremaceae, Nyctanthaceae, and Eriocaulaceae of the World as to Valid Taxa, Geographic Distribution, and Synonymy" reveals the fact that the states of Maine, Vermont, Massachusetts and Idaho can be added to the states in which Verbena bracteata Lag. & Rodr. has been found, albeit in only very scattered localities, while V. stricta has been found in Arizona and Utah.

On the other hand, the extent and boundaries of geographic distribution indicated for most of the species in the Verbenaceae herein treated appear to be largely assumed since thus far they are not substantiated by actual herbarium specimens.

"FLORA ANALÍTICA E FITOGEOGRÁFICA DO ESTADO DE SÃO PAULO" by João Angely, Volume 3, 1--lx & 457--684 & 17 pp., illus. 1970. Volume 4, i--xii & 685--892 & 19 pp., illus. 1971. Volume 5, i--xii & 893--1084 pp. & 17 pp., illus. 1971. PHYTON, Universidade de São Paulo, São Paulo, Brazil.

The first two volumes of this valuable flora were favorably reviewed in this journal about a year ago. Now it is time to draw attention to these three continuing volumes of prodigious botanical work covering in all 6,326 species in 1,254 genera and 157 families. There are 1,692 geographic distribution maps and 18,472 plant names indexed.

In reference to the material on the Verbenaceae in Volume 4 a few items noted are: Petraea violacea in the index instead of Petunia violacea; Lippia gehrtii, Erimus, Petrea, officinalis, and Timotocia misspelled; Verbena melindre treated as a scientific rather than a vernacular name; the incorrect accreditation of Verbena peruviana (L.) Britton; the omission from the index of the following Verbena species treated quite properly in the text - V. gracilescens, V. hirta, V. hispida, V. hybrida and V. incisa; and the inaccurate indexing of Verbena ephedroides as "sphedroides". These, of course, are merely unintentional slips in an otherwise highly valuable work.

"FLOWERING PLANTS OF JAMAICA" by C. D. Adams, 848 pp., University of the West Indies Press, Mona, Jamaica. 1972.

This beautiful tropical isle of some 4,400 square miles has along with its crops, adventive weeds, pantropics with showy flowers, a very fascinating and diversified native flora and until now no comprehensive available botanical guide to it. The estimated total of known native and fully naturalized flora here is 2,888 species in 996 genera and 173 families.

Since there are no drawings included, a greater burden is placed upon the text, but it hold up well under it.

Checking the Verbenaceae against H. N. Moldenke's recent (1971) "Fifth Summary of the Verbenaceae, Avicenniaceae, Stilbaceae, Dicrastylidaceae, Symphoremaceae, Nyctanthaceae, and Eriocaulaceae of the World as to Valid Taxa, Geographic Distribution, and Synonymy", I find a few taxa recorded by him from Jamaica but not accounted for in this flora, viz., Aegiphila martinicensis, A. nervosa, Bouchea prismatica var. longirostra, Callicarpa cubensis, Citharexylum pentandrum, C. spinosum, C. x perkinsi, C. x jamaicense, C. fruticosum var. subvillosum, C. fruticosum var. villosum, Clerodendrum aculeatum var. gracile, C. angustifolium, C. indicum,

Cornutia coerulea, C. pyramidata, Duranta repens var. alba, D. repens var. serrata, Smelina elliptica, Lantana arida, L. camara var. aculeata, L. camara var. mista, L. camara var. nivea, L. camara f. parvifolia, L. trifolia f. hirsuta, Petrea volubilis var. pubescens, Phyla nodiflora var. reptans, P. strigulosa var. sericea. Aegiphila oligoneura is treated by Moldenke as only a variety of the widespread A. martinicensis, while Clerodendrum speciosum is actually nothing more than a variety of C. umbellatum Poir. extremely close to the typical variety, if not actually the same; certainly not a hybrid! Lantana angustifolia is not endemic to Jamaica because it has also been collected in Oriente, Cuba. Also, it is very likely that Lantana involucrata does not occur on the Galápagos, the plants so identified there all being L. peduncularis Anderss. The Clerodendrum incisum in cultivation in Jamaica is not the typical form, but is var. macrosiphon. The following binomials have apparently had their orthography or accreditation "corrected" from the original: Lantana urticaefolia, Cornutia thyrsoides, Lantana brittoni and Clerodendrum thomsonae. Letters are inadvertently shifted in "the year" on p. 633.

This book represents years of diligent work and will be tremendously useful to botanists for years to come. Our congratulations to the author!

"PHOTOBIOLOGY OF MICROORGANISMS" - Responses in the Visible Spectral Region, edited by Per Halldal, x & 479 pp., illus., Wiley-Interscience, London, Sydney, Toronto & New York, N.Y. 10016. 1970. \$19.50.

This book consists of 14 papers, each in similar format starting with an introductory outline and ending with a thorough bibliography. At the end there are author, taxonomic and subject indexes.

Photosynthesis, which is "probably the most elaborate process for absorption and transformation of light energy" is treated as the main subject in only two chapters because so much recent material is already in print on it.

The topics considered are: photobiological principles and methods, photosynthetic apparatus of microalgae and its adaptation to environmental factors, photosynthetic bacteria, organic photometabolism, light effects on ion fluxes and carbohydrate and protein metabolism in algae, synchronous cultures, microorganismic photomotion, phototaxis and photokinesis in flagellates, light-oriented chloroplast movements, fungal photo-responses, photobiology of circadian rhythms in protozoa, etc., and bioluminescence in bacteria and fungi and marine protozoa.

There is a wealth of carefully organized and documented material between the covers of this book!

"MICROBIAL ECOLOGY" by Martin Alexander, x & 511 pp., illus., John Wiley & Sons, Inc., London, Sydney, Toronto and New York, N.Y.

10016. 1971. \$12.95.

"This book, as an introduction, should open the door to both new and important problems in applied (pollution, medicine, public health, plant pathology, soil science, food production, limnology, oceanography, etc.) or basic (microbiology, bacteriology, mycology, phycology, protozoology, virology, etc.) fields creating a foundation for the reader to delve [into] more thoroughly or comprehend more fully those aspects of greatest interest to him."

The book is divided into three parts. The first is about the community and its development, considering dispersal, colonization, succession, climax, nutrition, tolerance range, geography, microniches and natural selection. The second is about interspecific relationships involved in homeostasis, commensalism, proto-cooperation, symbiosis, competition, amensalism, parasitism and predation. The third part deals with the effect of microorganisms on their surroundings in terms of biogeochemistry, animals, and plants.

At the end the microorganisms mentioned in the text are all listed taxonomically. There is a useful index. At the end of each chapter pertinent literature is listed as reviews of the topic or as other literature cited.

The exposition is in clear, simple, accurate language.

"ENVIRONMENT, POWER, AND SOCIETY" by Howard T. Odum, ix & 331 pp., illus., Wiley-Interscience, London, Sydney, Toronto & New York, N. Y. 10016. 1971. \$9.95.

"Intended for the general reader, this account also attempts to introduce ecology through the energy language. Hopefully, it may be useful to the widespread efforts under way in undergraduate colleges to develop courses in human ecology." With other readings this choice would be stimulating and useful. "Energy diagraming helps us consider the great problems of power, pollution, population, food and war free from the fetters of indoctrination." Copious, excellent, obvious diagrammatic illustrations are used throughout. They and the text are closely integrated.

The book describes the world system with and without highly industrialized man; the basic energy laws operating in our biosphere, including man's high energy requirements for his machines; power in ecological systems, for man, for order and evolution, for economics, for politics, for a religious basis whose "God is in exponential growth"; electrical simulation of energy networks like computers; and partnership with nature as our only chance for survival on "spaceship earth -- the urban sector, the agricultural sector, and the wilderness life-support sector" using "energy values for evaluation rather than money that belongs to only part of the system."

Bibliography, index and an appendix with energy module formulas are provided.

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REDUCTION OF BALISAEA TO AESCHYNOMENE (LEGUMINOSAE)

Velva E. Rudd

Smithsonian Institution

The monotypic genus Balisaea Taubert recently caught my attention. Upon checking the original description and the excellent illustration I found the type species, B. genistoides Taubert, to be identical with my Aeschynomene irwinii.

Taubert recognized that his Balisaea was related to Cyclobium and Aeschynomene but did not have fruit available to place it in either of those genera. Since my original opinion stands, that this taxon is referable to Aeschynomene, a new combination is in order:

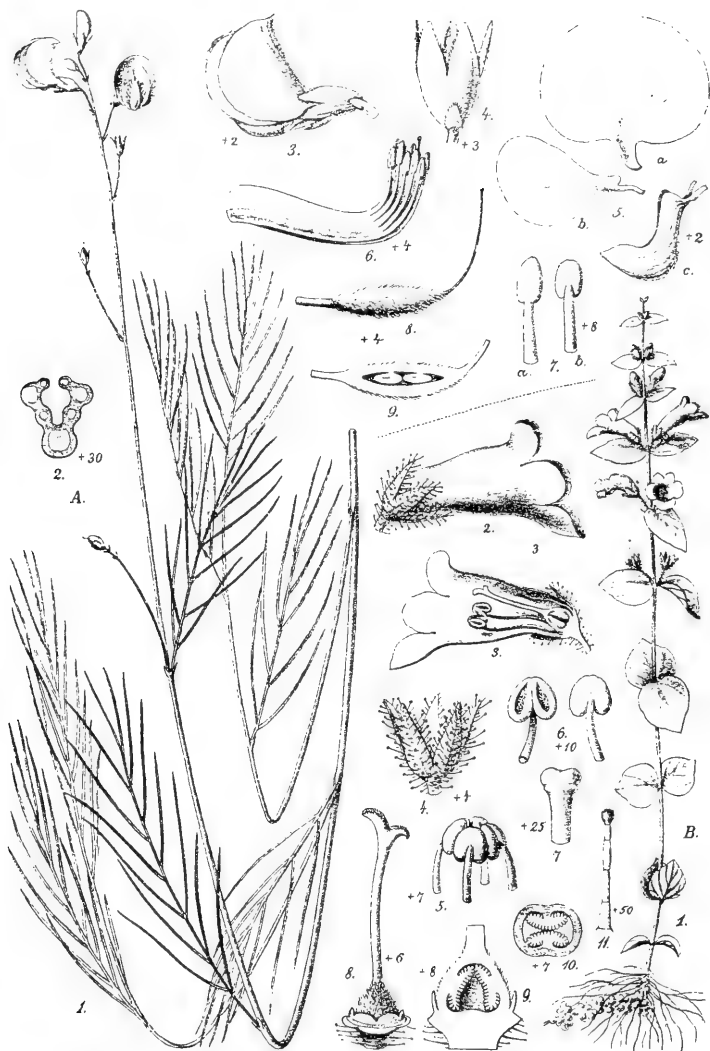
AESCHYNOMENE GENISTOIDES (Taubert) Rudd, comb. nov.

Balisaea genistoides Taubert, Bot. Jahrb. 21: 43, tab. 2, fig. A. 1895. Type: E. Ule 2837, Brazil, Goiás, "in campis montium Serra de Balisa," September 1892, in flower. Holotype: B ? destroyed ? Isotypes ?

Aeschynomene irwinii Rudd, Phytologia 15: 117, fig. 1. 1967. Type: H. S. Irwin, et al. 9367, Brazil, Goiás, Chapada dos Veadeiros, ca. 13 km. N. W. of Veadeiros, 20 October 1965, in fruit. Holotype: US. Isotype NY.

To my knowledge this unique species with its needle-like leaflets is known only from the two collections cited above.

Taubert's original figure is here reproduced.

*Engler, Bot. Jahrb. XXI. Bd.**Taf. II.**Fig. A. Balisuea genistoides* Taub.*Fig. B. Goyazia rupicola* Taub.

An Unusual Begonia Inflorescence

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Northeastern University Botanical Institute and Greenhouses
35 Cambridge Street, Woburn, Massachusetts 01801

It was rather startling to run across a plant with superior carpels in the Begonia collection. One that was remindful of the flowers of Paeonia. It was on a plant whose stems were covered with miniature adventitious embryos, a cultivar with the name "Fairy" (see Plate I).

There were four flowers in the inflorescence. Two normal pistillate flowers (see Plate II), and two teratological flowers with separate hypogynous carpels (see Plate III).

This seemed sufficiently strange and unusual to be worthy of recording. The family Begoniaceae has inferior ovaries, although Hillebrandia has its perianth sufficiently far from the style base as to have the ovary only partially inferior, but even so the carpels are firmly united.

The only other references to comparable conditions in Begonia seen by the writers were to a flower with several stamens and two separate superior carpels and with a wing-like growth on the pedicel, which was mentioned and illustrated in an editorial in the Gardeners' Chronicle ("Hybrid Begonias", Gardeners' Chronicle, Series 3, 2: 560. 1887.), and in a recent article by George Kalmbacher ("Begonia Flowers", Begonian 38: 32-34. 1971.).

J. D. Hooker (Curtis's Botanical Magazine 122: t. 7457. 1896.) remarks that the male flowers of Begonia umbraculifera Hooker f. are polygamous with several carpels at the center of the ring of stamens in those flowers. His illustration shows this condition.



PLATE 1. Begonia plant bearing two normal and two teratological flowers in its inflorescence.

----- - 1 cm



PLATE II. View of a teratological flower (in front) showing absence of ovary, and normal flower (rear right) showing inferior ovary.



PLATE III. Face view of teratological flower showing separate superior carpels.

Stomatal Patterns in the genus Begonia¹.

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In the study of leaves of several species of Begonia it has been observed that on the lower epidermis various stomatal patterns exist in the genus. This pan-tropic genus is large, consisting of approximately a thousand species distributed among some seventy sections of the genus.

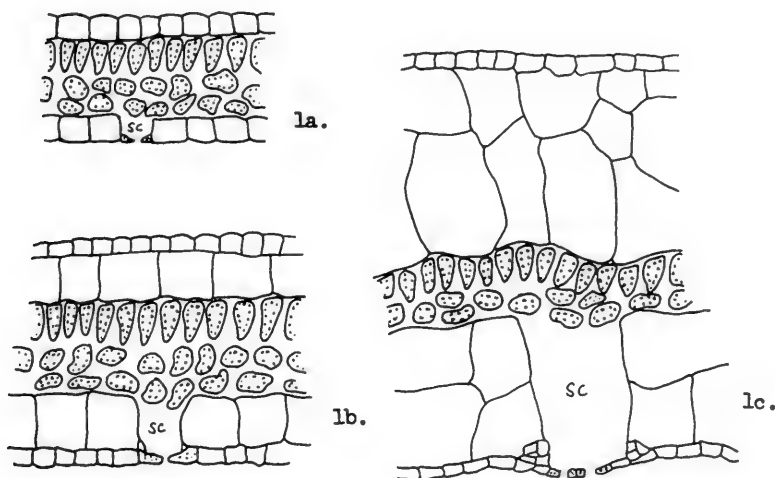


Figure 1. Cross sections of Begonia leaves showing the various types of epidermal layers in the genus and the stomatal chambers (sc).

1a. B. evansiana Andrews.

1b. B. paulensis A. DC.

1c. B. acetosa Vellozo.

Scale |——| .1 mm.

¹ The Begonia specimens used in this study were contributed by the Kartuz Greenhouses, Wilmington, Massachusetts.

As Fellerer (1892), Barkley & Boghdan (1968, 1969), and Barkley & Hozid (1971) have recorded, the morphology and anatomy of the Begonia leaf is quite interesting, especially regarding the various types of epidermal layers which occur. The epidermis, depending on the species, can be uniseriate (single upper and lower epidermis), biseriate (double upper and lower epidermis), or multiseriate (with three or more layers of upper and lower epidermis) (Fig. 1).

Another interesting feature of the Begonia leaf morphology, is the various types of stomatal patterns found associated with the lower epidermis. Fellerer (1892) first described the stomata of Begonia and its ontogeny. Payne (1970) described and classified the mesogenous stoma in Begonia as helicocytic (Fig. 2a) and described the ontogeny of this type of stoma. The stomata in Begonia have been observed by the authors to occur in several types

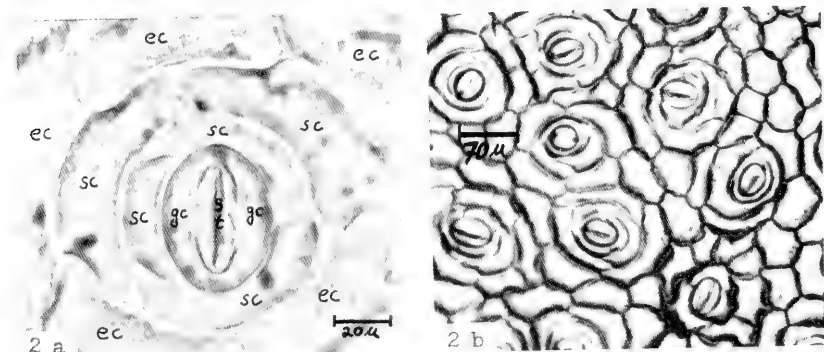


Figure 2. Cellulose acetate impressions of the lower epidermis and stomata of Begonia leaves.

2a. B. purpurea Sweet showing a single stoma (st), guard cells (gc), subsidiary cells (sc) and epidermal cells (ec). X 400.

2b. B. purpurea Sweet showing single stomata separated by epidermal cells. X 100.

2c. B. paulensis A. DC. showing clusters of stomata separated by epidermal cells. X 100.

of patterns. One pattern, the simplest is that with each stoma appearing by itself surrounded by subsidiary cells and separated from other stomata by epidermal cells (Figs. 1a-c). If the stomata occur in clusters (Fig. 2c), the stomatal chamber is as wide as the cluster and as deep as the layers of epidermal cells.

Depending on the species, the leaf may have only stomata occurring singly as illustrated in figures 2a and 2b, or in some species there may be single stomata as well as clustered, compound stomata, or there may be only compound stomata in clusters. Where compound stomata occur, the number of stomata in a cluster may vary somewhat from cluster to cluster on the same leaf.

Table 1 lists the Begonia studied, the taxonomic section of that species, the area where the species is native, its type of epidermis, and the number of stomata per cluster found on the lower surface. As mentioned previously, where stomata are compound, the number of stomata are not constant from cluster to cluster, even in the same species. The table gives the number of stomata observed in clusters for a species, with the predominant type of cluster underlined. In the species observed, not a single one had stomata on the upper surface. Plates 1 and 2 refer to species in Table 1.

Among the Begonia species studied by the authors, there appears to be correlation of stomatal patterns, number of stomata in a cluster, and the type of leaf epidermis of each particular species. Where the upper and lower epidermis is uniseriate, the stomata (with the exception of Begonia goegoensis N. E. Brown) occur as single stoma, while those Begonia with a multicellular epidermis, have the stomata compound in clusters.

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TABLE 1. Correlation of stomatal pattern and the type of epidermis in the genus Begonia.

Species	Section	Native of	Type of epidermis	Number of stomata per cluster
<u>B. cathayana</u> Hemsl.	Platycentrum	China	Uniseriate	1
<u>B. rex</u> Putzeys var.	Platycentrum	India	"	1
<u>B. pustulata</u> Liebm.	Weilbachia	Mexico	"	1
<u>B. imperialis</u> Lemaire	Weilbachia	Mexico	"	1
<u>B. liebmanni</u> A. DC.	Weilbachia	Mexico	"	1
<u>B. goegoensis</u> N. E. Br.	Reichenheimia	Sumatra	"	1, 2, 3
<u>B. acida</u> Vellozo	Pritzelia	Brazil	"	1
<u>B. purpurea</u> Sweet	Begoniastrium	Jamaica	"	1
<u>B. masoniana</u> Irms.	Coelocentrum	Singapore	"	1
<u>B. olsoniae</u> Sm. & Sch.	Pritzelia	Brazil	Biseriate	2, 3, 4, 5, 6
<u>B. paulensis</u> A. DC.	Begoniastrium	Brazil	"	2, 3, 4
<u>B. mannii</u> Hook. f.	Tetraphila	Africa	"	1, 2, 3, 4
<u>B. incana</u> Lindl.	Knesebeckia	Mexico	"	1, 2, 3
<u>B. floccifera</u> Bedd.	Reichenheimia	India	Multiseriate	2, 3, 4, 5, 6
<u>B. acetosa</u> Vellozo	Pritzelia	Brazil	"	2, 3, 4, 5
<u>B. venosa</u> Skan	Gireoudia	Brazil	"	4, 5, 6, 7

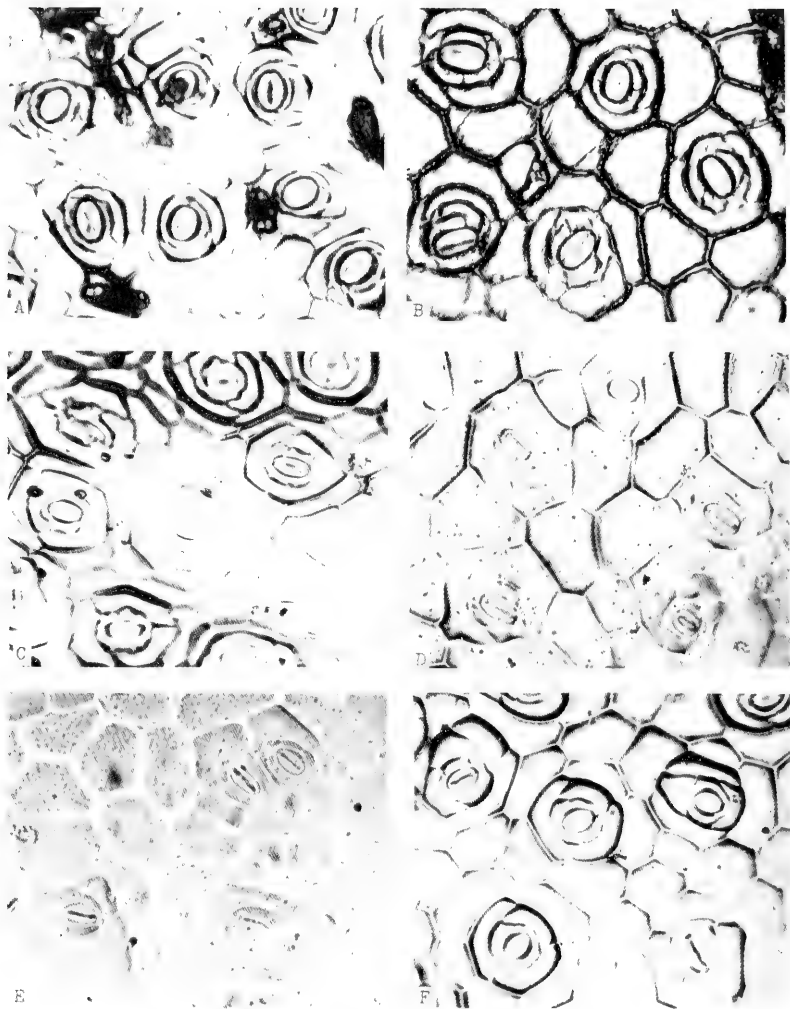


PLATE I. Cellulose acetate impressions of stomata from the lower epidermis of *Begonia* species in which their upper and lower epidermis are uniseriate. (A) *B. cathayana* Hemsley; (B) *B. rex* Putzeys; (C) *B. pustulata* Liebmann; (D) *B. liebmannii* A. DC.; (E) *B. goeogensis* N. E. Brown; (F) *B. masoniana* Irmscher. 70 μ

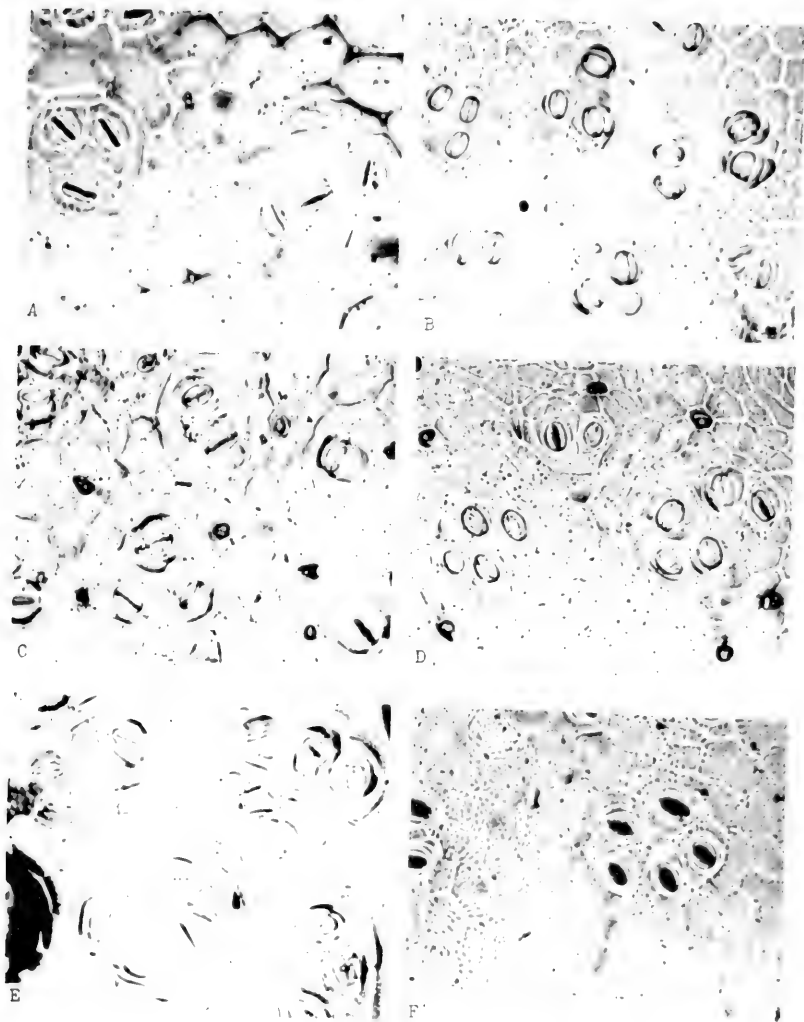


PLATE II. Cellulose acetate impressions of stomata from the lower epidermis of Begonia species having biseriate upper and lower epidermis (A - C; figure 2 c), and having multiseriate epidermis (D - F). (A) B. olsoniae Smith & Schubert; (B) B. marnii Hooker f.; (C) B. incana Lindley; (D) B. floccifera Beddome; (E) B. acetosa Vellozo; (F) B. venosa Skan ex Hooker f. $\overline{70\mu}$

STUDIES IN AMERICAN PLANTS, IV

Dorothy N. Gibson
Field Museum of Natural History

Studies in the family Gesneriaceae for the Flora of Guatemala resulted in the discovery of a few new species and, perhaps of more importance, led to a new evaluation of some close generic relationships, requiring the transfer of some species to other genera.

I wish to thank the curators of the U. S. National Herbarium and the New York Botanic Garden for their kindness in lending specimens, and especially to express my appreciation to Mr. Conrad V. Morton, of the U. S. National Herbarium, for his continued interest, cooperation, and helpful comments.

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ALLOPLECTUS Mart.

The difficulties in separating certain species of Alloplectus and Columnnea have been discussed by various authors, and in 1969, Dr. Wm. T. Stearn, in his paper, The Jamaican species of Columnnea and Alloplectus (Gesneriaceae), Bull. Brit. Mus. Bot. 4: 181-236, took an important step toward clarifying this situation by defining the two genera much more narrowly than has been done before. By restricting the corolla characters of Columnnea to those species with "a distinctly bilabiate red or yellow corolla, with the four upper (posterior) lobes fused and extended into a galea, the lower (anterior) lobe narrow and bent downwards...", and by placing in Alloplectus those species with the corolla limb "regular or almost so with five short rounded lobes" [Sect. Stygnanthe (Hanst.) Hanst. and Sect. Collandra (Lem.) Hanst.] he has provided us, at least for the Guatemalan representatives of these genera, with a practical solution to an old and complicated problem. It seems to me not only convenient but highly desirable to follow his suggestions instead of clinging to previous vague generic descriptions, especially since the fruits of many species remain unknown. In my forthcoming treatment of the Gesneriaceae for the Flora of Guatemala, I am reinstating Alloplectus calochlamys Donn.-Sm. (Columnnea calochlamys Morton), and propose the following new combinations:

ALLOPLECTUS VINACEUS (Morton) D. Gibson, comb. nov.
Columnnea vinacea Morton, Contr. U. S. Nat. Herb. 29: 38. 1944
(type from Solola, Guatemala, Steyermark 47408).

ALLOPLECTUS VIRIDIS (Morton) D. Gibson, comb. nov.

Columnea viridis Morton, Contr. U. S. Nat. Herb. 29: 38. 1944
(type from Alta Verapaz, Guatemala, Goll 187).

DRYMONIA Mart.

DRYMONIA PSILA D. Gibson, sp. nov.

Frutices epiphyticae interdum repentes, rami glabri; folia late elliptica vel oblanceolata breviter acuminata integra glabra, 9-25 cm. longa, basi cuneata obliqua; pedicelli 1-2, glabri, 0.5-1 cm. longi; bracteae parvae, inconspicuae, caducae; calyx glaber, lobis 5, oblongo-ovatis vel lanceolatis acutis 1-2 cm. longis; corolla alba vel cremoricolor, interdum purpureo-maculata, glabra, 3-3.5 cm. longa, limbus obliquus, lobis 5, crenatis, lobus anticus plus minusve fimbriatus; antherae oblongae cohaerentes inter se, basaliter dehiscentes; ovarium superum glabrum; stigma stomatomorphum; capsula ignota.

Shrubby, sometimes scandent epiphytes, glabrous throughout, the stems more or less quadrangular, often red or purplish; leaves on petioles 1-3.5 cm. long, those of a pair subequal or unequal, the blades coriaceous, broadly elliptic to oblanceolate, mostly 9-25 cm. long, short-acuminate, cuneate and often oblique at the base, glabrous on both surfaces, paler beneath, margins entire, lateral veins 5-7 pairs; pedicels 1-3, glabrous, 0.5-1 cm. long; bracts small and inconspicuous, linear-lanceolate, caducous; calyx glabrous, accrescent, the 5 segments unequal, one considerably smaller than the others, oblong-ovate to lanceolate, acute, 1-2 cm. long; corolla white or cream-colored, sometimes marked with purple, glabrous, 3-3.5 cm. long, the tube a little saccate at the base, ampliate above, the limb oblique, the 5 lobes more or less rounded, crenate, the anterior one more or less fimbriate; anthers oblong-linear, about 3 mm. long, united face to face, dehiscent basally, the pores uppermost until the pollen is shed; ovary superior, glabrous; stigma stomatomorphic; disk gland solitary; fruits unknown.

GUATEMALA: Izabal, Cerro San Gil, uppermost ridges and summit, 1,200-1,300 meters, Steyermark 41980, type (F), (US); Alta Verapaz, near the Finca Sepacuite, Cook & Griggs 469 (US).

Three species formerly placed in Alloplectus were found to have anthers typical of Drymonia, appearing sagittate at the base, and united by their inner faces with the pores (at the base of the thecae) uppermost until the pollen is shed; in addition, the corolla tubes of all of these species are ampliate upward, not contracted in the throat, and the corolla lobes are spreading, the limb oblique and more or less bilabiate. The following new combinations are therefore proposed:

DRYMONIA GUATEMALENSIS (Morton) D. Gibson, comb. nov.

Alloplectus guatemalensis Morton, Contr. U. S. Nat. Herb. 29: 37. 1944 (type from San Marcos, Guatemala, Steiermark 76403).

DRYMONIA MACRANTHA (Donn.-Sm.) D. Gibson, comb. nov.

Alloplectus macranthus Donn.-Sm. Bot. Gaz. 31: 117. 1901 (type from Cubilguitz, Alta Verapaz, Guatemala, Tuerckheim 7642).

DRYMONIA OINOCHROPHYLLA (Donn.-Sm.) D. Gibson, comb. nov.

Alloplectus oinochrophyllus Donn.-Sm. Bot. Gaz. 54: 239. 1912 (type from Pansamala, Alta Verapaz, Guatemala, Tuerckheim 1080).

KOHLERIA Regel

KOHLERIA SKUTCHII Morton and Gibson, sp. nov.

Sect. Moussonia. Frutices graciles usque ad 2-3 m. alti; folia oblongo-ovata vel elliptico-oblonga, acuminata, serrata vel crenata, 12-25 cm. longa, basi rotundata aut subcordata; inflorescentiae axillares, pedunculo elongato, 7-9 cm. longo; bracteae obovatae, foliiformes, 10-15 mm. longae; calyx velutinus, lobis late ovatis vel obovatis acutis vel obtusis 4-5 mm. longis; corolla cinnabarina, lobis suborbicularibus pectinato-denticulatis; stigma stomatomorphum; capsula ignota.

Slender shrubs 2-3 m. tall, the stems and branches velutinous with multiseptate, reddish hairs; leaves opposite, on velutinous petioles 3-7 cm. long, the blades oblong-ovate to elliptic-oblong, mostly 12-28 cm. long, 5-13 cm. wide, acuminate, oblique and rounded to subcordate at base, densely velutinous to tomentose above, velutinous below, the margins serrate to crenate, the lateral veins 9-10 pairs; inflorescences axillary, the common peduncle elongate, 7-9 cm. long, velutinous, the pedicels usually 4, sometimes 3, velutinous, 3-4 cm. long, subtended by a pair of obovate, leaflike bracts 10-15 mm. long; calyx densely velutinous, the lobes broadly ovate to obovate, acute or obtuse, 4-5 mm. long; corolla erect in the calyx, 3.5-4 cm. long, the tube orange-red, velutinous outside, slightly dilated at the base but not saccate, more or less ventricose above, 10-15 mm. wide, the lobes yellowish, marked with red, 7-9 mm. long, suborbicular, the margins more or less pectinate-denticulate; stamens short-exserted, the filaments inserted on the base of the corolla tube, pubescent, dilated at base, the anthers initially connate, quadrate in outline; ovary densely villous; style pubescent; stigma stomatomorphic; disk annular, the glands much reduced, irregular and inconspicuous; capsule unknown.

GUATEMALA: Quezaltenango, 2,400 meters, Fuentes Georginas, near Zunil, Skutch 906, type (US). MEXICO: Chiapas, 2,585 meters, Pinabeto, Motozintla, Matuda 15430.

Probably most closely related to K. deppeana (Schlecht.

and Cham.) Fritsch and to K. elegans (Dcne.) Loesener, which differ in their smaller leaves (the blades mostly 6-15 cm. long), in their bracts (linear to very narrowly oblanceolate) and in their calyx lobes (triangular and acute to subulate at the apex in K. deppeana, linear to linear-lanceolate and attenuate to the apex or subulate in K. elegans).

NIPHAEA Lindley

NIPHAEA SAXICOLA (Brandege) D. Gibson, comb. nov.

Napeanthus saxicola Brandege, Univ. Calif. Publ. Bot. 6: 65. 1914 (type from Chiapas, Mexico, Purpus 6701).

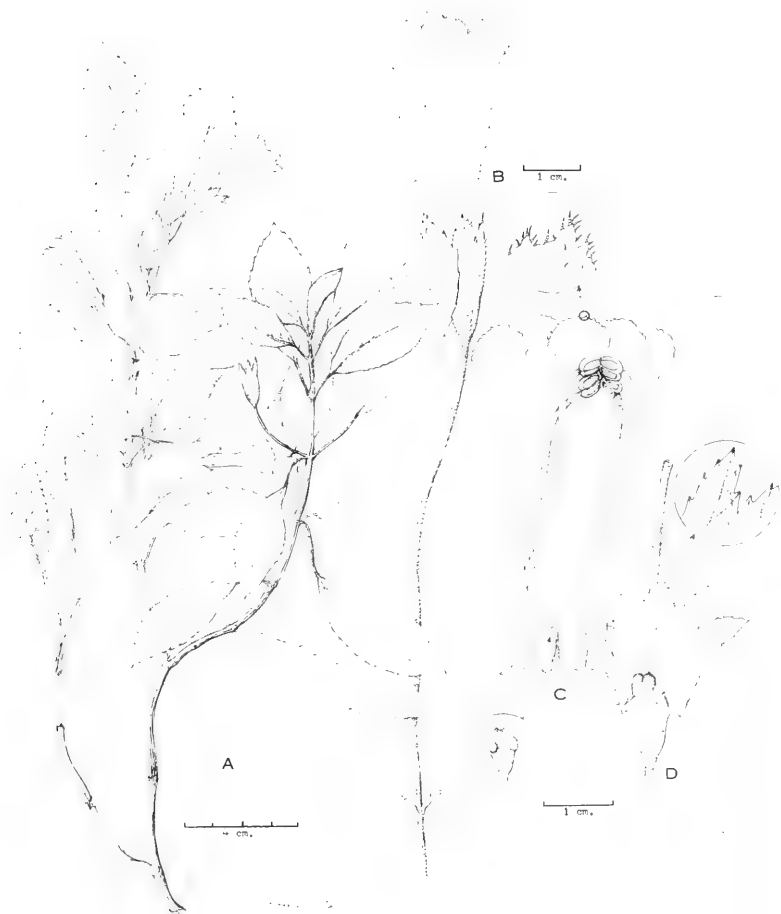
The half-inferior ovary and the subglobose anthers with distinct thecae not confluent at the apex are characteristic of Niphaea. The small corollas, about 6 mm. in diameter, and the calyx lobes with more or less crenulate or denticulate margins near the apex distinguish the species.

SOLENOPHORA Benth.

SOLENOPHORA CHIAPASENSIS D. Gibson, sp. nov.

Frutices subrepentes vel ascendentes, rami juniores plus minusve villosi; folia opposita, subaequalia vel disparia, petiolis 1-4 cm. longis sparse villosis, laminis ellipticis vel oblanceolatis 3-9 cm. longis, acutis vel abrupte acuminate, serratis, supra sparse pubescentibus vel scabellis, infra glabratibus, praeter costas et nervos brevilliosis, nervorum 7-8 paribus praesentibus; inflorescentia axillaris, pedunculus communis obsoletus vel brevissimus et inconspicuus 3-8 mm. longus, pedicelli solitarii vel geminati, sparse brevivillosi, 2-3.5 cm. longi; bractee lineares inconspicuae; calyx ruber, tubuloso-campanulatus, 8-15 mm. longus, lobis triangularibus, 4-5 mm. longi, acuti, denticulati; corolla aurantiaca, 3 cm. longa, sparse villosa, lobis fimbriato-denticulatis; glans disci solitaria plus minusve bilobata, apex pubens; capsula 8 mm. longa, inclusa in calyce accrescente.

Weak shrubs, subrepent or ascending to perhaps a meter tall, branching, the older stems glabrate, the younger stems and branches more or less villous with very short, reddish, multiseptate, spreading hairs; leaves of a pair subequal to unequal, on petioles 1-4 cm. long, the blades elliptic to oblanceolate, mostly 3-9 cm. long, 1.5-4.5 cm. wide, acute or abruptly short-acuminate, cuneate or attenuate to the base and often oblique, the margins serrate, sparsely pubescent to somewhat scabrous above, glabrous below except on costae and veins which are more or less short-villous, often red or reddish, the lateral veins 7-8 pairs; inflorescences axillary, the pedicels usually solitary, sometimes geminate, sparsely short-villous, 2-3.5 cm. long, subtended by a pair of small, inconspicuous, linear bracts, the common peduncle obsolete or if present, inconspicuous, 3-8 mm. long; calyx rose-red or



PLATE

Solenophora chiapasensis. A, habit; B, pedicellate flower; C, corolla opened to show stamens and staminodes; D, calyx opened to show bilobate disk gland and style.

reddish, tubular-campanulate, 8-15 mm. long, almost glabrous or thinly villous, more densely so near the base, the lobes triangular, mostly 4-5 mm. long, acute, denticulate; corolla orange, about 3 cm. long, sparsely villous or almost glabrous, the limb to 1.5 cm. wide, the lobes semiorbicular, 3-5 mm. long, the margins fimbriate-pectinate, usually conspicuously so, and often more or less ciliate; stamens about equalling the corolla or slightly exserted, the anthers 1.5-2 mm. long, united by their tips; disk gland solitary, large, very shallowly and irregularly bifid or bilobate, more or less pubescent, at least near the apex; style pubescent; stigma stomatomorphic; capsule about 8 mm. long, enclosed in the accrescent calyx; seeds broadly fusiform.

MEXICO: Chiapas, Municipio of Tenejapa, 9,100 feet, Breedlove 15187, type (F); Shilom Ton 1768; 6,600 feet, Breedlove 10741; 7,600 feet, Breedlove 6996.

Previously identified as *S. tuerckheimii* Donn.-Sm. which differs in its larger leaves (mostly 8-15 cm. long with 8-10 pairs of lateral veins), its subumbelliform to cymose inflorescences with peduncles mostly 3-8 cm. long, and its short calyx lobes (mostly 1-2 mm. long, very rarely to 3 mm.) that are very broadly and irregularly subtriangular and obtuse to nearly rounded rather than acute.

SOLENOPHORA MACULATA D. Gibson, sp. nov.

Frutices vel herbae suffruticosae; folia late elliptica vel ovato-elliptica 11-25 cm. longa acuminata, duplicato-serrata, supra sparse villosa, infra glabrata; pedunculus communis 1-2 cm. longus, pedicelli 2-3 cm. longi, bracteati; calyx 2-2.5 cm. longus, lobis triangularibus denticulatis; corolla lutea vel aurantiaca intus purpureo-maculata 2.5-3 cm. longa, tubo villosa; glans disci solitaria, plus minusve bilobata.

Shrubs or suffruticose herbs, simple or sparsely branched, the young stems reddish, usually villous, later more sparsely villous or glabrate; leaves of a pair subequal, on glabrous petioles 5-10 cm. long, the blades broadly elliptic or ovate-elliptic, mostly 11-25 cm. long, 8-14 cm. wide, short-acuminate, oblique at base, sparsely short-villous above, glabrate beneath, the costae and veins rose-red, the margins doubly serrate, the lateral veins 9-12 pairs; inflorescence axillary, the common peduncle 1-2 cm. long, sparsely pubescent or glabrate; bracts oblong-lanceolate or oblong-elliptic, 0.5-1 cm. long; pedicels glabrous, 2-3 cm. long; calyx suffused with rose or maroon, sparsely villous near the base, glabrous above, 2-2.5 cm. long, the triangular lobes unequal, 2-4 mm. long, more or less denticulate; corolla 2.5-3 cm. long, deep yellow or orange-yellow, spotted or striped with maroon within, the tube erect,

ampliate above, about 1 cm. broad below the lobes, not constricted, villous outside, the lobes about 4 mm. long, irregularly undulate; stamens exserted, the anthers about 2 mm. long, united by their tips; style exserted; disk gland solitary, more or less bilobate.

GUATEMALA: Between Todos Santos and Finca El Porvenir, middle slopes of Volcán Tajumulco, San Marcos, 1,300-3,000 meters, Steyermark 36992, type (F).

This species may be distinguished from the other large-leaved species in our area by its much shorter corollas. It is similar in many ways to S. pirana Morton, but that species has longer peduncles (commonly 5-10 cm. long), and the corollas of S. pirana are not only longer (4-5 cm.) but are not spotted nor marked within.

SOLENOPHORA OBLIQUA Denham and Gibson, sp. nov.

Frutices vel arbores debiles, usque ad 6 m. altae, rami sparse pubescentes vel glabrati; folia opposita, petiolis glabris, 3-12 cm. longis, laminis 14-30 cm. longis, oblongo-ovatis vel elliptico-oblongis acuminatis vel acutis duplicatis, serratis, supra sparse pilosis, infra glabratiss vel glabris; inflorescentia cymosa, pedunculus communis ad 2 cm. longus, pedicelli 0.5-3 cm. longi, bracteati; calyx glaber, 3.5-4 cm. longus, plus minusve bilabiatus urceolatus, lobis denticulatis; corolla 6.5-7.5 cm. longa, glabra aurantiaca, limbus ca. 3 cm. latus, lobi intus purpureo-maculati, fimbriato-denticulati; glans disci solitaria bilobata, pubens; calyx multo longior quam capsula.

Shrubs or weak trees to 6 m. tall, the stems and branches glabrate or sparsely, bifariously pubescent with multiseptate hairs; leaves opposite, subequal, the petioles essentially glabrous, mostly 3-12 cm. long, the blades oblong-ovate to elliptic-oblong, acuminate or acute, cuneate or rounded at the base and usually very oblique, mostly 14-30 cm. long, 7-17 cm. wide, sparsely pilose above, nearly glabrous beneath, the margins doubly serrate, the lateral veins 10-14 pairs; inflorescences axillary, cymose, the common peduncle 1-2 cm. long, glabrous (sometimes the flowers solitary, the peduncle then much reduced and inconspicuous), pedicels 0.5-3 cm. long, glabrous, bibracteate, the bracts leaflike, mostly 2-3 cm. long, sometimes caducous in age; calyx glabrous, brownish or green with orange-brown stripes, 3.5-4 cm. long, accrescent, 3-4 times longer than the ovary, conspicuously urceolate in bud, the limb narrowly contracted, oblique, more or less bilabiate, the 5 lobes irregular, short, 3-8 mm. long, triangular to lanceolate, appearing irregularly denticulate but the lobules actually rounded and obtuse, sometimes minutely papillate within, the tube in anthesis becoming deeply cleft on one side for about 2/3 of its length, the

calyx then appearing narrowly tubular-campanulate; corolla 6.5-7.5 cm. long, glabrous or nearly so, erect in the calyx, yellowish-orange to reddish-orange outside, deep yellow to orange and sometimes marked with maroon within, the tube gradually ampliate, the limb somewhat oblique, about 3 cm. wide, the 5 lobes broadly suborbicular, spotted with purple or maroon within, the margins rounded and more or less fimbriate-pectinate; stamens 4, didynamous, short-exserted, the glabrous filaments inserted on the base of the corolla tube, the anthers about 3 mm. long, initially united by their tips, the thecae oblong, fully dehiscent; a staminode usually present; ovary inferior; style densely pubescent; stigma stomatomorphic; disk gland solitary and usually deeply bilobate, or 2 glands connate at the base, pubescent; capsule far surpassed by the calyx tube, rupturing irregularly near the middle when mature, containing numerous, minute, reddish-brown, shining, ellipsoidal to fusiform seeds.

GUATEMALA: Quezaltenango, western slopes of Volcán Zunil, opposite Santa María de Jesus, alt. 1,500 m., Steiermark 35182, type (F); between San Martín Chili Verde and Colomba, alt. 1,800 m., Standley 85478 and 85523; El Pocito, south of San Martín Chili verde, on road to Colomba, alt. about 2,200 m., Standley 85049; between Quebrada Chicharro and Montaña Chicharro, on southeast-facing slope of Volcán Santa María, alt. 1,300-1,400 m., Steiermark 34329. Chimaltenango, Johnson 1785. San Marcos, wet mountain forest near Aldea Fraternidad, west-facing slope of the Sierra Madre Mountains, alt. 1,800-2,400 m., Williams, Molina, & Williams 26209 and 26251.

Differs from S. purpusii Brandegee in its longer, more narrow, urceolate calyx.

SOLENOPHORA TOUCANA Denham and Gibson, sp. nov.

Frutices usque ad 4 m. altae, rami et petioli plus minusve pilosi; folia opposita oblongo-ovata vel oblongo-elliptica, 16-30 cm. longa acuminata, duplicato-serrata, supra sparse vel dense pubescentia vel pilosa, infra pilosa non nisi in costis et nervis tantum; inflorescentia cymosa, pedunculus communis ad 5 mm. longus, pedicelli 5-15 mm. longi, bracteati; calyx campanulatus, 1.5-2.5 cm. longus, pilosus, fere truncatus, lobi denticulati; corolla aurantiaca 5.5-7 cm. longa, pilosa, limbus 3-3.5 cm. latus, lobi intus rubro-maculati fimbriato-denticulati; glans disci solitaria bilobata pubens; capsula ignota.

Shrubs 2-4 m. tall, the stems and branches more or less pilose with multiseptate hairs; leaves opposite, subequal, on pilose petioles mostly 5-12 cm. long, the blades oblong-ovate to broadly oblong-elliptic, mostly 16-30 cm. long, usually acuminate, rarely acute, obliquely cuneate to nearly rounded at the base, sparsely or densely pubescent to pilose above,

pilose beneath on costae and veins, otherwise pubescent or glabrate, the margins doubly serrate, the lateral veins about 10 pairs; inflorescences axillary, cymose, the common peduncle seldom more than 5 mm. long, more or less pilose, the pedicels 5-15 mm. long, pilose, bibracteate, the bracts linear, ciliate; calyx urn-shaped in bud, becoming campanulate and 1.5-2.5 cm. long at anthesis, about 3 times longer than the ovary, accrescent, more or less pilose, densely so near the base, very shallowly lobate and appearing almost truncate, the margins unevenly denticulate; corolla orange outside, yellow within, 5.5-7.5 cm. long, erect in the calyx, the tube gradually ampliate, pilose outside, the limb 3-3.5 cm. in diameter, the lobes suborbicular, broadly rounded, spotted with red within, the margins minutely fimbriate-denticulate; stamens 4, didynamous, short-exserted, the filaments usually sparsely pubescent, inserted on the base of the corolla tube, the anthers united by their tips, the thecae fully dehiscent; staminode present; ovary inferior; the style exserted, densely pubescent; stigma stomatomorphic; disk gland solitary and usually deeply bilobate or 2 glands connate at the base, pubescent; capsule unknown.

EL SALVADOR: Depto. Chalatenango, banks of Río Sumpul at boundary between El Salvador and Honduras, alt. ca. 2,250 m., Tucker 1172, type (UC); (F, NY, US, PH). HONDURAS: Depto. La Paz, 2,100 m., Molina y Molina 14072; Depto. Ocotepeque, 1,800 m., Molina 22359. GUATEMALA: Depto. Guatemala, Palencia, 1,480 m., Morales 947.

The only large-leaved species in our area with a nearly truncate calyx limb.

SIX NEW SPECIES OF PARMELIA (LICHENES) FROM AFRICA

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1. Parmelia chowoensis Hale, sp. nov.

Fig. 1

Thallus adnatus, corticola, coriaceus, albocinereus, 4-6 cm latus, lobis subirregularibus, 2-2.5 mm latis, contiguus vel subimbricatis, margine bulbato-ciliatis, parce inflatis basi, superne planus, nitidus, emaculatus, sorediis isidiisque destitutis, cortex superior 14-18 μ crassus, stratum gonidiale 15-10 μ crassum, medulla alba, 70-90 μ crassa, cortex inferior 12 μ crassus, subtus castaneus, modice rhizinosus, rhizinis castaneis, simplicibus. Apothecia numerosa, subpedicellata, 2-4 mm diametro, amphithecio crenato, disco imperforato, sporis octonis, 3-4 x 6-7 μ .

Holotype: Zambia: Chowo Forest, Nyika Plateau, collected by Memeika Jellicoe, no. 53, April 1969 (BM; isotype in US).

Chemistry: Cortex K+ yellow (Atranorin), medulla K-, P+ red, C- (protocetraric acid).

This small species in section Bicornuta is characterized by the pale lower surface and the presence of protocetraric acid. Only one other species, P. subinflata Hale from the Philippines, produces this acid, and it too has weakly inflated bulbate cilia. Another African species, P. hypocraea Vainio, is superficially close but has distinct bulbae and salazinic acid.

2. Parmelia composita Hale, sp. nov.

Fig. 2

Thallus expansus, corticola, coriaceus, laxe adnatus vel suberectus, viridi-cinereus, 8-15 cm latus, lobis rotundatis, 5-15 mm latis, margine ciliatis, ciliis 1-3 mm longis, superne planus, nitidus, valde albomaculatus, aetate rimosus, cortex superior 18-20 μ crassus, stratum gonidiale 20 μ crassum, medulla alba, 130-150 μ crassa, cortex inferior 15 μ crassus, subtus niger vel marginem versus castaneus vel albo-variegatus, centro rhizinosus, rhizinis sparsis, simplicibus vel furcatis, longis, margine nudus. Apothecia pedicellata, 3-15 mm diametro, disco perforato, sporis octonis, 10-12 x 22-24 μ , episporio 2 μ crasso.

Holotype: Tanzania: 2 km N of Kitoto Camp, Mt. Meru, E. slope, Arusha Prov., elev. 2500 m, collected by R. Santesson, no. 22985a, 7 Jan. 1971 (UPS; isotype in US).

Chemistry: Cortex K+ yellow (atranorin), medulla K+ red, P+ orange, C+ rose, (gyrophoric and norstictic acids).

Additional specimens examined: Same locality: Santesson 21594a, 22850, 23069c (UPS); 21594a, 22886b (UPS, US).

This Amphigymnia species appears at first to be related to Parmelia perforata (Jacq.) Ach.), and American species which also has norstictic acid. P. composita, however, produces in addition gyrophoric acid, the first instance of the joint occurrence of these two acids, as far as I am aware, and has a darker mottled margin below rather than the distinct pure white rim of P. perforata. It also has larger spores and the less dense but strong maculation more typical of P. pseudonilgherrensis Asah.

3. Parmelia enormis Hale, sp. nov.

Fig. 3

Thallus expansus, enormis, 10-30 cm latus, coriaceus, saxicola, cinereo-albidus, lobis sublinearibus, centro imbricatis, 5-8 mm latis, margine integris vel axille ciliatis, superne planus, nitidus, emaculatus, sorediis isidiisque destitutis, cortex superior 20-22 μ crassus, stratum gonidiale 30-40 μ crassum, continuum, medulla alba, 130-150 μ crassa, cortex inferior 16-20 μ crassus, subtus pallide castaneus, dense rhizinosus, rhizinis pallidis, elongatis, simplicibus. Apothecia numerosa, subpedicellata, 3-8 mm diametro, disco imperforato, sporis octonis, 6-7 x 8-11 μ .

Holotype: Zambia: On granite rocks, Zambia Rest House, Nyika Plateau, elev. 7600 ft., collected by Memeika Jellicoe, s.n., September 1968 (BM; isotypes in TNS, US).

Chemistry: Cortex K+ yellow (atranorin), medulla K+ red, P+ orange, C- (salazinic acid).

The presence of cilia in the axils of this most remarkable lichen places it in section Imbricaria, although superficially, because of the linear lobes, it seems to be a Hypotrachyna species. P. usambarensis Stein. & Zahlbr., another very large linear-lobed, saxicolous species in Africa, differs in having isidia and

a black lower surface.

4. Parmelia pachydactyla Hale, nom. et stat. nov. Fig. 4

Parmelia caperata var. isidiophora Steiner, Stiz. K. Akad. Wiss. Wien Math.-Naturw. Cl. 106:215. 1897.

Parmelia steineri Dodge, Ann. Mo. Bot. Garden 46:125. 1959.

Based on P. caperata var. isidiophora Steiner [not P. steineri Gyelnik, Ann. Mycol. 36:289. 1938 (= P. molliscula Acharius)].

Holotype: Kenya: Athi Plains, Liechtenstein s.n. (WU).

Chemistry: Cortex K- (usnic acid), medulla K-, P+ red, C-, (protocetraric acid).

Additional specimen examined: S. Rhodesia: Zimbabwe, Div. Victoria, L Kofler, 27.6.1963 (LD,US).

The type of this saxicolous lichen is rather fragmentary but the discovery of a better specimen by Kofler in Rhodesia has provided good material for a fuller understanding of the species. The lobes are quite adnate and rather narrow (1-2 mm) and the "isidia" scattered and very thick (about .3 mm wide and .5 mm high). It would appear to be related to the pantemperate P. caperata (L.) Ach., a larger species with soredia. P. rudis Harm. from Indochina has the same chemistry but the isidia are much finer.

5. Parmelia subschimperii Hale, sp. nov. Fig. 5

Thallus laxe adnatus, corticola, 6-12 cm latus, viridi-cinereus, lobis rotundatis, 10-18 mm latis, margine ciliatis, ciliis 1-2.5 mm longis, sorediatis, soraliis linearibus vel pro parte irregularibus et submarginalibus, superne planus, nitidus, crasse albo-maculatus, cortex superior 15-18 μ crassus, stratum gonidiale 20-25 μ crassum, medulla alba, 100-120 μ crassa, cortex inferior 12-14 μ crassus, subtus niger, sparse rhizinosus, rhizinis simplicibus, ambitu nudus, castaneus. Apothecia ignota.

Holotype: Kenya: Bamboo zone, National Park Road, W. slope, Mt. Kenya, elev. 2700-3100 m, Nanyuki Distr., Central Prov. collected by R. Santesson, no. 22150 (UPS; isotype in US).

Chemistry: Cortex K+ yellow (atranorin), medulla K-, P-, C-, KC+ rose (norlobaridone).

Additional specimens examined: Kenya: Mt. Meru, Arusha, Prov., Santesson 21583a (UPS), 22911b, 22912a, 22943 (UPS, US); same locality as holotype, Santesson 22042b, 22173 (USP, US).

As the name implies, P. subschimperi (subg. Amphigymnia) is related to P. schimperi Mull. Arg., which may in fact be considered its nonsorediate counterpart. P. schimperi has similar strong white maculae and a dark lower surface, even toward the marginal zone. Norlobaridone is now known to be rather common in Amphigymnia (Kurokawa, Jour. Hattori Bot. Lab. 32:205-218. 1969). One other norlobaridone-containing species in Africa, P. hababiana Gyelnik, could be confused with P. subschimperi, but it has smaller more membranous lobes, uniformly short cilia, smaller maculae, and a more or less distinct white or mottled zone below at the margin. P. pseudonilgherrensis Asah. is very close in overall morphology but contains alectoronic acid.

6. Parmelia xanthoparmelioides Hale, sp. nov.

Fig. 6

Thallus laxe adnatus, saxicola, viridi-flavicans, 4-8 cm latus, lobis linearibus, dichotome ramosis, 1.5-2.5 mm latis, eciliatis, superne planus, nitidus, emaculatus, apicem versus granulato-sorediatus, sorediis crassis, pro parte subfatiscentibus, cortex superior 12-14 μ crassus, stratum gonidiale 20-25 μ crassum, medulla alba, 100-130 μ crassa, cortex inferior 12-14 μ crassus, subtus niger, modice vel sparse rhizinosus, rhizinis tenuibus, dichotome divisus. Apothecia ignota.

Holotype: South Africa: Cliffs on hills NW of Woodhead Reservoir, Table Mtn., Cape Prov., collected by N. S. Pillans 3857, February 1920 (BM; isotypes in LD, US).

Chemistry: Cortex K- (Usnic acid), medulla K+ red, P+ orange, C-(salazinic acid).

Were it not for the presence of dichotomously branched rhizines, this species would appear to be in the P. stenophylla group of subgenus Xanthoparmelia. As is the case with P. sinuosa (Sm). Ach., another yellow species formerly placed in Xanthoparmelia, the correct sectional disposition is better made according to rhizine characters. A very similar rare species from

tropical America, P. meyeri Zahlbr., also has usnic and salazinic acids but is smaller, closely adnate, and has more pustulate soralia.

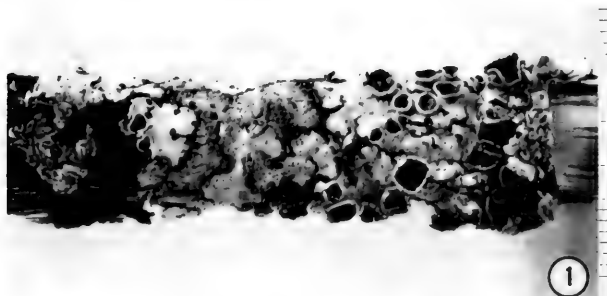


Fig. 1. Isotype of Parmelia chowoensis (US). Fig. 2. Isotype of P. composita (US). Scale in mm.



3



4

Fig. 3. Isotype of Parmelia enormis (US). Fig. 4. Parmelia pachydactyla (Kofler, US). Scale in mm.

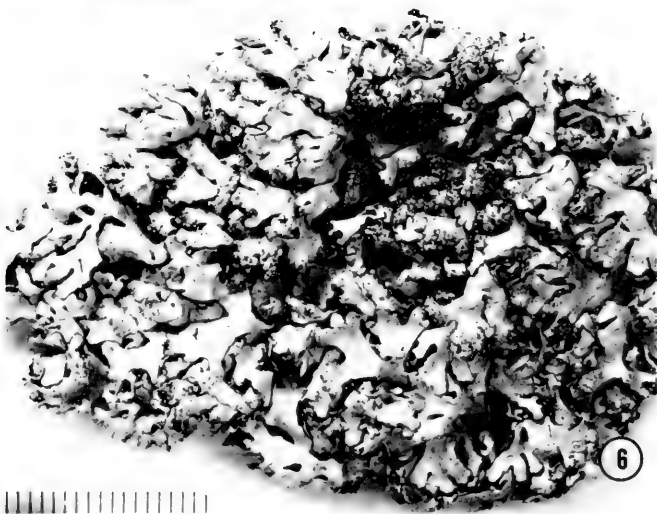


Fig. 5. Isotype of Parmelia subschimperi (US). Fig. 6. Isotype of P. xanthoparmelioides (US). Scale in mm.

MISCELLANEOUS NOTES ON NEOTROPICAL FLORA, II.

by Jose Cuatrecasas

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These notes are descriptions of new taxa extracted from a paper which for a long time is in the hands of the publisher of another journal. They are preliminary, partial studies to be supplemented in forthcoming monographs now in preparation. Genera involved in these notes are *Diplostephium*, *Oritrophium*, *Vernonia* and *Espeletia* (Compositae), all from Andean collections. The work has been partially sponsored by the National Science Foundation.

DIPLOSTEPHIUM RITTERBUSHII Cuatr. sp. nov.

Frutex parvus 30 cm ad 1 m altus, caule circa 8 mm diametro a basi ramoso ramis robustis erectis tuberculato cicatricosis parce ramulosis ramulis extremo dense foliosis glandulosis glutinosis et hirsutulo lanuginosis, pilis rigidiusculis inaequaliter furcatis 1-3 mm longis intricatis denique deciduis tectis.

Folia alterna coriacea rigida sessilia subelliptico-oblonga ad basim paulo angustata apice attenuata subacutaque margine incrassati-revoluta, 12-18 mm longa 4-6 mm lata; supra glabra viridia nitidula copiose minute impressae glanduloso-punctata tantum costa paulo visibili; subtus densiuscule villosa-lanuginosa pilis longis paulo flexuosis intricatis tecta sed costa crassa prominenti glabraque basi magis dilatata bene conspicua.

Capitula quinque subterminalia congeste racemosa ex foliis subtendentibus brevioribus angustioribusque axillaria. Pedicelli crassiusculi hirsuto-sublanati usque ad 1 cm longi. Capitula radiata tubuloso-campanulata circa 12 mm longa 6 mm diametentia, circulo ligularum 14 mm diametro. Involucrum villosa-lanuginosum 8-9 mm altum, phyllariis 4-seriatis exterioribus linearilanceolatis 5-5.5 x 1-1.2 mm extus longe piloso-lanuginosis et sparse glandulosis, interioribus linearibus acutis dorso glandulosis margine ciliatis subapicem pilosis, 7.5 x 0.8-1 mm. Receptaculum 3 mm diam alveolatum marginibus alveolarum dentatis.

Flores radii feminei ligulati circa 23 in capitulo. Corolla alba 8 mm, tubo 3-3.3 mm pilosulo pilis pluricellularibus subclaviformibus ad 0.15 mm longis sursum densioribus, lamina lineari 4.7-5 mm longa 0.8-1 mm lata 2-3 dentata glabra vel supra sparsissimis pilis minutis adpressis. Stylus circa 5 mm longus. Ovarium 2-2.2 mm longum obovoideo-oblongum sursum sparsis vel sparsissimis minutis glandulis vel pilis praeditum. Pappus 4-4.2 mm setis exterioribus tantum 0.5-2 (-3) mm acutis, interioribus sursum leviter dilatatis.

Flores disci pseudohermaphroditi circa 23 in capitulo. Corolla lutea 5 mm longa tubo 2.5 mm pilis subclaviformibus

minutis circa 0.1 mm longis copiosis ornato, limbo 2.4-2.5 mm inferne contracto pilosque dentibus 5 interdum 4 triangularibus acutis conniventibus glabris 0.5 mm. Antherae 1.5 mm longae basi minute auriculatae appendice oblonga obtusiuscula glanduloso-punctata. Filamenta uniformia stricta glabra. Stylus corollam excedens extremo sublanatus piloso-papillosus apice breviter bifidus. Ovarium lineare 4 mm longum sparsis minutis glandulis et raris minutis pilis munitum. Pappus 4 mm longum setis exterioribus 1-2 mm strictis acutis interioribus ad apicem paulo dilatatis.

Typus: Colombia, Huila: West slope below Pico Norte of Nevado del Huila, 13,800 feet altitude (range is 13,600-14,000), very abundant, collect. Jan. 11, 1970 by Philip C. Ritterbush, s.n. Holotypus, US.

Species named for Dr. Philip C. Ritterbush, scientific historian and scholar, also alpinist and explorer who led two expeditions to the abrupt Nevado del Huila. During his second expedition in 1970 he escalated the highest peak, the Pico Mayor, jointly with Steve Salva and Cary Ullin. See Ritterbush, Conquest of Huila, rev. Americas 22(1):19-25 and frontispice, Jan. 1970, and Report of the 1970 Expedition to the Nevado del Huila, Central Andean Cordillera, Colombia. Occasional Publ. Mus. Dep. Hist. Nat. Cali, Colombia, 1970.

DIPLOSTEPHIUM CAMARGOANUM Cuatr. sp. nov.

Frutex ramis foliosis teretibus dense adpresseque cinereo-crispulanatis.

Folia alterna coriacea rigidula. Petiolus 6-12 mm longus rigidulus adpresse crispulanatus supra sulcatus subtus teres basi ampliatus amplexans. Lamina oblongo-elliptica utrinque attenuata apice acuta vel subacuta basi cuneata margine integra plana, 4-8 cm longa 1.5-3.2 cm lata; supra viridis nitens plusminusve viscosa, sparsis pilis malpighiaceis vel inaequaliter furcatis, vel excepto costa impressa minute pilosa glabrata, nervis secundariis filiformibus venulis reticulatis paulo prominulis; subtus cinerea dense adpresseque crispulanata, costa eminenti, nervis secundariis minus prominentibus 7-9 utroque latere subpatulis et arcuato-anastomosatis, venulis reticulo parum visibili instructis.

Inflorescentiae corymboso-paniculatae subterminales folia suprema valde excedentes, 8-12 cm longae 2-6 cm latae, axe elongato modice tenui sed recto erectoque adpresse crispulanato cinereo nudo, tantum superne ramis ramulisque parvis subfastigiatis cinereo-lanatis, ultimis capitula 2-3 breviter pedicellata vel singula ferentibus instructo. Bractee bracteolaeque subtendentes ovatae subobtusae vel subacutae dorso lanatae vel glabratae 1.5-0.5 mm longae. Pedicelli crispulanati 1-10 mm longi tantum apice parvis bracteolis minimis capitulum adjacentibus.

Capitula brevissime radiata circa 10 mm longa 2.5-3 mm lata, 18-24 flores involucrum valde excedentes ferentia.

Involucrum tubulosum 5.4-6 mm altum, phyllariis 5-6-seriatis imbricatis straminosis rigidisque margine anguste hyalino-membranaceis plus-minusve eroso-ciliatis extus parce sparseque papillosis tantum infimis breviter pilosis dorso sursum brunnescentibus ceterum stramineis, interioribus 3.6-4 x 0.8-1.2 mm elliptico-oblongis obtusiusculis medianis ovato-oblongis 3-3.3 x 1.2-1.3 mm exterioribus ovatis 2-1.5 x 1.3 mm intermediis gradatim transeuntibus. Receptaculum 1.4 mm diametro alveolatum marginibus alveolorum membranaceis.

Flores radii feminei 7-10 in capitulo. Corolla 3.5-4 mm longa minute ligulata, tubo recto crassiusculo supra medium minute puberulo pilis antrorsis tenuibus circa 0.2 mm longis, lamina 0.7-0.8 mm longa 3-dentata dentibus triangularibus 0.3-0.4 mm raro bidentata, saepe labio adaxiali lineari circa 0.5 mm longo interdum bifido saepe minutum dentem reducto. Stylus 3.5 mm longus crassiusculus basim dilatatus, ramis 0.5 mm longis lineari-subulatis marginato-stigmatiferis corollam non excedentibus. Ovarium 2.2-2.5 mm longum fertile oblongo-obovoideum obtuse tricostatum paulo compressum pubescente pilis geminis antrorsis rectis acutis circa 0.3 mm longis. Pappus albidus circa 3.5 mm longus setis biseriatis strigulosis acutis paulo inaequalibus parcis brevioribus 2-2.5 mm sursum levissime dilatatis.

Flores disci pseudohermaphroditi 11-14 in capitulo. Corolla 4-4.5 mm longa parte media dilute pubescens pilis tenuibus circa 0.2 mm longis, tubo 1.8-2 mm longo, limbo anguste infundibuliformi lobis 5 oblongis acutatis marginatis 1 mm longis glabris apice papilloso. Antherae 1.3 mm longae basi auriculatae apice appendice triangulari-oblonga acuta 0.4 mm longa. Stylus 4.5 mm longus basi incrassata cum annulo nectarifero cincta, ramis anguste lanceolatis 0.8 mm longis extus dense antrorseque papilloso-pilosis. Ovarium lineare 3 mm longum tricostatum sterile vacuum, densiuscule pubescente pilis geminis antrorsis circa 0.3 mm longis. Pappus 3.5 mm longus albidus, setis complanatis strigulosis subaequilongis sursum parum ampliatis interdum parcis brevioribus.

Typus: Colombia, Boyacá: Arcabuco, alrededores de la poblacion 2739-2850 m alt, 20-X-1965 col. G. Huertas & Luis A. Camargo 6309. Holotypus US.

DIPLOSTEPHIUM ASPLUNDII Cuatr. sp. nov.

Frutex ramis terminalibus copiose ramulosis fusco-brunneis argute striolulatis hirsutis, pilis ad circa 2 mm longis plus-minusve flexuosis acutis ochraceis. Ramuli ad ramos racemose dispositi dense foliosi et copiose indumento lanuginoso-hirsutulo praediti, ad extremos vestimentum densius.

Folia alterna copiosa et patula in ramulis, modice coriacea. Petiolus circa 2 mm longus fere planus subtus lanuginosus basi amplexans. Lamina 6-8 x 3-2.5 mm, elliptica vel oblongo-elliptica utrinque attenuata apice acutata mucronulataque margine bene revoluta; supra viridis nitidula glabra laevis

vel leviter undata tantum costa depressa notata; subtus fusco-ochracea dense lanata costa incrassata tantum conspicua.

Capitula radiata solitaria sessilia ramulos foliosos terminantia, 12-14 mm alta, 23-37 flores ferentia, circulo ligularum 30-35 mm diametientia. Involucrum 9-9.5 mm altum, 5 mm diametro, phyllariis 5-seriatis papyraceis stramineis lilacino-lineatis maculatisque, margine anguste scarioso, extus breviter albido-pubescentibus pilis flexuosis subadpressis, interioribus lanceolato-linearibus acutis 7-8 x 1 mm, exterioribus lanceolatis 5-3.5 x 1-0.7 mm, magis pubescentibus. Receptaculum 15 mm diametro marginibus alveolarum membranaceis.

Flores radii feminei ligulati 14-21 in capitulo. Corolla violacea 19-20 mm longa, tubo 4 mm ad apicem parvis minutis pilis, lamina lineari-oblonga obtusa minute 3-dentata 4-nervata. Stylus 7 mm, ramis linearibus strictis 2 mm longis. Ovarium 2.5 mm longum oblongum ad basim paulo attenuatum cum basi callosa 5-costatum copiose glandulosum, glandulis lacrimiformibus sessilibus vel minute pediculatis. Pappus 7.5-8 mm longus rubescenti-stramineus setis inaequilongis strictis strigosis exterioribus dimidio vel tertio brevioribus.

Flores disci hermaphroditi 9-16 in capitulo. Corolla olivaceo-lutescens circa 8 mm longa; tubo 2.8 mm apice parvis pilis flexuosis 0.2 mm; limbo tubuloso-ampliato basi parvis minutis pilis, dentibus 1.4-1.5 mm longis oblongis acutis incrassato-marginatis apice papilloso, extus sursum copiosis glandulis ad extremo saepe parvis pilis sericeis tenuissimis flexuosis 1-6 mm longis praeditis. Antherae 2.5 mm basi sagittatae appendicibus apicalibus oblongis attenuatis 0.7 mm longis. Stylus 10-10.5 mm, ramis 1 mm lineari-lanceolatis extus dense papilloso-hirsutis. Ovarium 4-3.6 mm 5-nervatum copiose glandulosum, basi parvis vel parvissimis pilis tenuibus circa 0.5 mm. Pappus 8 mm longus, setis sursum leviter ampliatis, exterioribus circa 1 mm brevis vel 2-3 mm.

Typus: Ecuador, Tungurahua, Cordillera de Llanganates near Las Torres, 3500 m. alt, rays violet, disc corollae olivaceous-yellow, coll. Erik Asplund 9831. Holotypus, S.

DIPLOSTEPHIUM SAGASTEGUII Cuatr. sp. nov.

Frutex valde ramosus, ramis robustis adpresse lanatis denique gradatim glabratissimis, teretibus rugulosis, terminalibus crasse densissimeque albo-crispo-lanatis, ramusculis floriferis conferte foliosis tam crasse spisseque albo-lanatis 2-5 cm longis racemose dispositis numerosis congestis instructis.

Folia parva visu sessilia sed intra vestimentum bene petiolata. Petiolus planus membranaceus saepe trinervatus 3-3.5 x 1-1.2 mm, basi cum vagina circa 0.5 mm elongatus, adaxiale glaberrimum abaxiale dense crasseque lanatus. Lamina coriacea marginibus revolutissimis argute conchata visu ovata obtusa basi rotundata seu subcordata 2.5-3 x 1.8-2.2 mm, supra viridis nitidissima enervata sparsis pilis verrucoso-conicis subspinulosis minutissimis praedita, subtus cavitate infra

margines densissima lana alba repleta, etiam petiolo ascendenti cum vestimento crasso occulto.

Capitula radiata terminalia singula sessilia in extremis ramusculorum, 40-50 flores ferentia, circa 12 mm alta circulo ligularum 15 mm diametientia. Involucrum late tubulosum circa 9 x 5 mm, scariosum nitidum inferne lanuginosum, phyllariis imbricatis 6-seriatis interioribus oblongis obtusis 8 x 1.6-2.2 mm medianis usque 2.8 mm latis exterioribus ovatis 4-3 x 3 mm, omnibus nitentibus stramineis sed rubescenti-submarginatis et cum margine late scarioso hyalino fimbriato instructis. Receptaculum paulo convexum alveolatum 2 mm diametro.

Flores radii feminei ligulati 16-24 in capitulo. Corolla pallide violacea glabra 10.5-11.5 mm longa, tubo circa 2 mm, lamina elliptico-oblonga obtusa minute 3-dentata 4-nervata 1.8-2.2 mm lata. Stylus 5.5 mm ramis stricte linearibus obtusiusculis crasse stigmatico-marginatis 1.5 mm longis. Ovarium fertile juvenile 1.5 mm longum basim versus attenuatum striolatum praesertim sursum copiose glandulosum glandulis albicantibus suglobosis vel lacrimiformibus interdum minute pediculatis. Pappus 5.5 mm longus stramineus sed ad apicem purpurascens, setis interioribus acutissimis complanatis strigosis sursum leviter ampliatis exterioribus latioribus 0.4-1 mm longis.

Flores radii pseudohermaphroditi 20-24 in capitulo. Corolla 6-6.2 mm longa, tubo 1.5-1.7 mm glabro, limbo infundibuliformi tubuloso inferne sparsis pilis circa 0.3 mm, dentibus triangularibus acutis incrassato-marginatis apice papilloso 1-1.2 mm longis. Antherae 2.5 mm basi attenuatae breviter acuteque sagittatae appendicibus apicalibus oblongis apice attenuatis subobtusis 0.5 mm longis. Stylus 6.5-7 mm basi strangulatus cum minuto annulo nectarifero circumdatus, ramis lanceolato-subulatis 2 mm longis dense papilloso-hirsutis. Ovarium sterile lineare 5-nervatum exovulatum copiose glandulosum. Pappus 5.5 mm stramineus sursum purpurascentibus setis interioribus paulo inaequalibus sursum satis dilatatis exterioribus brevioribus, latiusculis 0.5-1.5 mm omnibus strigosis.

Typus: Perú, Libertad, Santiago de Chuco: Laguna La Victoria, camino hacia Consugo, 4000 m alt, ladera rocosa, arbusto con flores blanco-violáceas; col. 19-VII-1966, A. Sagastegui, A. Aldave, Fernández & M. Feekushima 6185. Holotypus, US.

ORITROPHIUM FIGUEIRASII Cuatr. sp. nov.

Herba rosulifolia scapifera rhizomate inclinato vel repente breviter rosulifero-ramoso copiose radicefero.

Folia omnia rosulata crasse herbacea viridia 12-46 mm longa obovato-oblonga vel oblongo-elliptica apice obtusa vel paulo attenuata subacutata 3-5 dentata, deorsum in pseudopetiolum latiusculum marginatum angustata, basi in vainam amplectentem margine membranacea ad 3-6 mm latam ampliata, utrinque bene rugulosa (in sicco) tantum costa subtus satis eminenti supra leviter impressa vel inconspicua alteris nervis invisibilibus,

subtus glabra, supra sparse pilosa marginibus inferne petioloque parce ciliatis, pilis pluricellularibus acutis ascendentibus vel patulis, rectis vel leviter flexuosis 0.3-0.7 mm longis praedita. Limbus 7-28 x 4-12 mm, petiolus 5-18 mm longus.

Scapi monocephali 6-32 cm longi singuli vel 2-3 in roseta, teneri recti erectique firmi fistulosi striolati violacei sparse bracteati, copiose sursum dense glandulosi, glandulis globosis minute pedicellatis 0.04-0.1 mm longis, interdum rarissimis pilis acutis circa 0.2 mm longis muniti. Bractee scaporum distantes ovato-oblongae sessiles parce ciliatae virides vel violaceae 3-7 mm longae 1.5-3 mm latae supremae 2-3 capitulum adjacentes.

Capitula radiata erecta circulo ligularum circa 18 mm diametro in vivo (18-25 mm in sicco, compressa), 51-123 flores ferentia. Involucrum conico-cupulatum 6-7 mm longum, phyllariis 4-seriatis subherbaceo-scariosis firmulis pallide viridibus extremo lilacinis margine hyalinis, interioribus 5-6 x 0.7-1 mm linearibus acutis uninervis margine sursum bene ciliatis, exterioribus 3.5-4.5 x 1.5-1.1 mm oblongis subobtusis costa et nervis lateralibus ascendentibus anastomasantibus notatis apice minute eroso-ciliatis, intermediis gradatis. Receptaculum alveolatum planum 2.2-3 mm diametro.

Flores radii feminei ligulati 28-66 in capitulo. Corolla alba 8-6 mm longa, tubo 1.8-2 mm longo sursum leviter ampliatum pilosiusculo, pilis flexuosis 0.1-0.3 mm, lamina lineari-oblonga apice attenuata subacuta vel obtusa integra vel minute 2-3-dentata glabra 3-4 venis obsoletis 0.7-0.9 (-1) mm lata. Stylus 3 mm ramis subulatis 0.5 mm longis. Achaenia ovoideo-oblonga haud compressa apice paulo angustata basi attenuata cuneata callosa 2.2-2.5 x 0.7 mm, 5-nervata copiose hispida pilis geminis antrorsis rigidis acutis 0.4 mm longis circa apicem parvis glandulis intermixtis praedita. Semina albida levissima oblongo-ovoidea. Pappus stramineus 2.5-3 mm setis subuniseriatis strigosis acutis paulo inaequilongis.

Flores disci pseudohermaphroditi 23-57 in capitulo. Corolla lutea vel luteo-viridula 3.3-3.5 mm longa, tubo 1.2-1.4 mm tantum ad apicem sparsis pilis vel papillis, limbo infundibuliformi inferne sparse piloso pilis flexuosis circa 0.2 mm, dentibus crassis oblongo-triangularibus margine minute papilloso extus subapicem sparsis pilis. Antherae 1.3 mm longae basi breviter sagittatae appendicibus apicalibus oblongis subacutis. Stylus 2.8-3 mm ramis erectis oblongis obtusiusculis extus dense breviterque papilloso-pilosus. Ovaria 2 mm longa linearia exovulata sterilia 5-nervata hispida pilis antrorsis geminis circa 0.4 mm, circa apicem parvis glandulis munita. Pappus quam in floribus radii.

Typus: Venezuela, Mérida: Llano Corredor, junto a la Sierra de Guirigay, lindero con Trujillo, páramo 3300 m alt, rósula, hojas crasas verde medio semimate haz, verdes o violáceas envés; escapo violáceo monocefalo con bractéolas verdes o verdoso violáceas. Capítulos extendidos 18 mm diámetro, lígulas blancas, flósculos amarillos o amarillo-verdosos, col. J. Cuatrecasas, M. López-Figueiras & L. Marcano-Berti no 28166.

Holotypus, US; isotypus MER.

ORITROPHIUM GRANATUM Cuatr. sp. nov.

Herba rosulifolia scapifera rhizomate visu brevi repente copiose fibroso-radicifero.

Folia omnia basilaria rosulata herbacea crassiuscula viridia supra nitida 25-65 mm longa 9-20 mm lata. Lamina obovato-oblonga apice subrotundata vel plus-minusve attenuata interdum acuta basim versus attenuata in pseudopetiolum alatum 3-6 mm latum, basi ampliatio-vaginata amplectenteque, sursum (quarto vel tertio superiori) dentata dentibus 2-5 utroque latere acutis antrorsis, marginibus glandulosis et ciliatis pilis tenuibus acutis patulis 0.5-2 mm longis ornata, utrinque copiose pediculato-glandulosa et sparse setifera, costa bene notata basim versus dilatata nervis lateralibus 2-3 utroque latere ascendentibus arcuato-anastomosatis vulgo inconspicuis.

Scapi monocephali axillares plures 6-30 cm longi argute striati erecti vel leviter curvati dense glandulosi glandulis globosis pediculatis 0.2-0.6 mm longis vestiti et sparse bracteati. Bractee distantes 15-5 mm longae 2-1 mm latae sparse glandulosae et pilosae, ad apicem scapi 2-4 bracteolae capitulum adjacentes.

Capitula radiata erecta solitaria ad terminationes scaporum, 110-140 flores ferentia, circulo ligularum 25-30 mm diametenti, disco 8-10 mm. Involucrum campanulatum subherbaceum 10-11 mm altum, phyllariis 4-seriatis paulo inaequalibus stricte lineari-lanceolatis acuminatisque acutis, interioribus 9-10.5 x 1-1.2 mm paleaceo-scariosis subhyalinis obscure uninerviis glabris tantum sursum apiceque margine-ciliatis, exterioribus 6-8.5 x 1.2-1.3 mm margine anguste scarioso ceterum viridulo sursum lilacinis intus saepe 3-nerviis visibilibus, extus copiose glandulosis glandulis globosis pediculatis 0.2-0.4 mm longis. Receptaculum alveolatum 4-5 mm diametro. Flores radii feminei ligulati biseriati fertilia interdum aliquis sterilia, 50-73 in capitulo. Corolla alba vel lilacina 10.5-12.5 mm longa, tubo 2.7-3 mm praecipue sursum sparse pilosum pilis circa 0.4 mm, lamina lineari oblonga 1-1.3 mm lata glabra 4 nervis inconspicuis apice angustata subacuta vel acuta integra vel minute 2-3-dentata. Stylus circa 3.5 mm longus vix exsertus ramis brevibus acutis 0.5 mm. Achaenia 2.4 mm longa ellipsoideo-oblonga haud compressa apice paulo contracta basi cuneata et callosa, 5-6 nervata, subhispido pilosa, pilis geminis antrorsis rectis circa 0.3 mm, ad apicem parvis glandulis fuscis minute pediculatis etiam praedita. Pappus rubescens circa 4 mm longus setis strigulosis uniseriatis inaequilongis.

Flores disci pseudohermaphroditi 60-70 in capitulo. Corolla lutescens 4.5-5.4 mm longa, tubulo 1.8-2.2 mm tantum apice parce pilosulo, limbo infundibuliformi tertio inferiori sparse piloso, dentibus triangularibus acutis 1 mm longis marginibus apiceque minute papillosis extus subapicem 2-4 minutis glandulis pediculatis munitis. Antherae 1.5 mm longae

basi breviter sagittatae appendicibus apicalibus oblongis acutatis. Stylus ramis 0.8-1 mm oblongis crassiusculis sub-acutis extus dense papilloso-hispidulis. Ovarium 2.2 mm exovulatum interdum ovulatum sterile 5-6 nervatum dilute antrorsopilosi subapicem parvis glandulis. Pappus 4-4.5 mm cum femineus similimus.

Typus: Venezuela, Merida: Sierra Nevada de Santo Domingo, Páramo de Los Granates: Cañada del Padre, 3370-3380 m alt; hoja verde brillante haz, escapos mas o menos purpúreos, lígulas desde blanco a liláceas, col. 12-X-1969. J. Cuatrecasas, L. Ruiz-Teran & M. López-Figueiras 28088. Holotypus US; isotypus MERF.

VERNONIA NEOGLEASONIANA Cuatr. sp. nov.

Arbor circa 6 m alta, ramulis ultimis brunneis teretibus copiose lenticellatis minute adpressequ tomentosis, denique glabratiss.

Folia alterna crassiuscule coriacea rigida. Petiolus 6-12 mm longus supra sulcatus ceterum breviter denseque tomentosus. Lamina late oblongo-lanceolata basi obtusa vel obtuse cuneata apice attenuata acutaeque margine revoluta integra, 4-7 cm longa 1.8-2.6 cm lata; supra in sicco sordide brunnescenti-viridis juvenilis puberula adulta glabra rugulosa costa valde impressa nervis secundariis filiformibus et minoribus plus-minusve impressis subtus viridi-ochracea dense lanuginoso-tomentosa costa satis prominenti nervis secundariis prominentibus 16-18 utroque latere patulis circa marginem arcuato-anastomosatis, nervis minoribus etiam prominentibus reticulum minutum elevatum formantibus.

Inflorescentiae terminales paniculatae subrotundatae congeste floriferae folia suprema vix attingentes, 6-10 cm amplae ramis alternis interdum oppositis angulatis striatisque dense hirsutulo-tomentosis viridi-ochraceis. Ramuli copiosi tenues flexuosi angulati tantum ad extremos bracteis pedicellos subtendentibus. Bractee strictae lineares pedicellos subaequilongae. Pedicelli angulati tomentelli recti vel flexuosi 8-3 mm longi tantum ad apicem 1-3 bracteolis minutis juxta capitulum.

Capitula cylindracea basi attenuata, 13-14 mm longa 5-6 mm lata. Involucrum 11-12 mm altum 28-30 phyllariis imbricatis circa 5-seriatis subcoriaceis rigidulis, extus adpresse villosis, intus ad apicem et marginibus plus-minusve villosis ceterum glabris nitidisque, interioribus oblongis acutatis 8-8.5 x 2-1.8 mm, medianis oblongo-ovatis latioribus usque ad 2.7 mm latis, externis ovatis 2-3 x 1.2-2 mm, ceteris gradatim transeuntibus. Flores 10-11 in capitulo; corolla pallide violacea 7.5-8 mm longa, tubulo stricto 4 mm longo sursum sparsis pilis minutis 0.1 mm longis, ad apicem parvis glandulis globosis, limbo tubuloso paulo ampliato sed maturitate in 5 lobos fere usque ad basim fisso, lobis linearibus 3-3.5 mm longis 0.5 mm latis acutis incrassato-marginatis denique recurvatis apice minute papilloso sursum extus sparsis pilis minutis antrorsis et copiosis glandulis globosis albis praeditis. Antherae

purpuraceae 2-7 mm longae basi sagittatae apice appendice oblonga sessili 0.5 mm longa. Stylus extremo 2.5 mm longitudine antrorso-papilloso maturitate ramis duobus subulatis 1.5 mm longis arcuato-divergentibus. Nectarium annulari-cupulatum circa 0.4 mm altum integrum. Ovarium oblongum basim angustatum basi breviter callosum, 10-costatum, pilis sparsissimis minutis saepe munitum, glandulis rotundis sessilibus deorsum copiose praeditum. Pappus stramineus 7 mm longus, setis longis interioribus biseriatis minute strigosus sursum levissime ampliat, setis exterioribus brevibus numerosis uniseriatis subcomplanatis strigulosus 0.3-1 mm longis.

Typus: Ecuador, Imbabura: East of Cayambe, ridge just south of Río Clavadero, along trail to Río San Pedro, 10,300 ft. alt. Coll. 27 Jul. 1944, Ira L. Wiggins no. 10483. Holotypus, US. Another collection: Ecuador, Paramos de San Juan, arbusto 4 m, flores blancas, Col. 26-II-1931, Benoist no. 3920.

Vernonia neogleasoniana belongs to section Critoniopsis. It is dedicated, in his 90th anniversary, to honor the outstanding botanist and specialist in Vernonia, Dr. Henry Allen Gleason, former professor of Columbia University and The New York Botanical Garden, now retired at Willowdale, Ontario.

ESPELETTIA GARCIAE Cuatr. sp. nov.

Caulirosula, caudice simplice vel extremo pauciramoso usque circa 6 m alto 6 cm diametro tantum ad apices folia crebra rosulata pallide viridia ferenti. Caules juveniles densissime barbati pilis circa 8 mm longis erectis ascendentibus flavescens tibus congestissimis tecti.

Folia coriacea, adulta rigida, breviter petiolata. Lamina 25-31 cm longa 7-12 cm lata, late lanceolata vel obovato-lanceolata acuta vel subacuta interdum obtusata, circa basin in petiolum brevem attenuata et in vaginam amplectentem producta, margine integra angustissime revoluta; supra juvenili dense villosa adulta scabrida subtomentosa, pilis robustis circa 1 mm longis basim incrassatis patulis extremo tenuibus ascendentibus curvatis, costa magis tomentosa nervis secundariis notatis; subtus costa crassa elevata, nervis secundariis 20-25 utroque latere prominentibus inaequaliter ascendentibus angulo 40°-60° divergentibus 1-2.5 cm inter se distantibus, nervis tertiis prominentibus in angulo acuto cum venulis reticulum prominentem formatibus, alveolis minutissimis pilis crispis albis densis tectis, reliqua subvillosa-tomentosa pilis ad 2.5 mm deorsum robustis patulis antrorsum tenuibus acutis arcuatis ascendentibusque supra costam nervosque saepe subsericeos copiosioribus densioribusque. Petiolus robustus 1.5-2.5(-5) cm longus 0.5-1 cm latus. Vagina fere semiorbiculata late amplectens crasse coriacea supra glabra extus dense tomentosa et inferne barbata, 14-22 mm alta 25-40 mm lata. Folia valde juvenilia mollia dense lutescenti subsericeo-villosa.

Inflorescentiae axillares folia attingentes vel paulo excedentes, 30-40 mm longae. Axis mediocris erectus leviter

striatus dense villosus vel tomentoso-villosus pilis curvato ascendentibus 1-2 mm longis, nudus tantum ad apicem paniculiferus. Paniculae corymbosae 8-15 cm longae 6-10 cm latae, ramis alternis interdum suboppositis teneris sed rigidis erectis leviter striatis dense tomentoso-villosis pilis patulo-ascendentibus flavis, bracteis subtendentibus anguste linearibus basi semiamplectentibus, inferioribus usque ad 2.5-7 cm longis 2-3 mm latis sursum gradatim brevioribus.

Capitula discoidea parvula subglobosa 5-8 mm alta 4-6.5 mm lata, sessilia 3-6 ad extremos pedunculorum 3-10 mm longorum hirta-tomentosorum congeste glomerata rare singula. Bracteolae lineares acutae pilosae 6-9 mm longae 1-2 mm latae. Involucrum 5-6 mm altum. Phyllaria sterilia 5 crassiuscule herbacea rigidula 3.5-6 mm longa 2-4 mm lata oblongo-elliptica vel late lanceolata acuta vel subacuta 5-9-nervata sursum ciliata extus moderate patulo-pilosa pilis acutis 0.2-0.6 mm et sparsis glandulis subsessilibus. Phyllaria fertilia (♀) obovata subacuta vel subobtusata basi callosa vetusta incrassatissima reliqua parte membranacea tenuia 2.6-3.5 x 1.5-2.5 mm dorso praecipue sursum margineque parce pilosa et glandulosa pilis 0.5 mm. Receptaculum conicum circa 2-2.5 mm altum 1-1.5 mm diam glabrum. Paleae disci membranaceae hyalinae 3-4 x 1.6-2.3 mm obovatae obtusissimae tenuiter plurivenosae subcarinatae amplectentes margine sursum parce ciliatae pilis obtusis sparsis et parcis glandulis subsessilibus praeditae.

Flores radii feminei 7-11 in capitulo 1-2-seriati. Corolla brevissima 0.5-1(-2) mm alta cum annulum 0.2-0.5 mm altum densissime crasso-pilosum saepe reducta sed saepe minutum appendiculum liguloidem abaxialem lineare vel ovatum integrum vel fissum 0.2-1(-2) mm longum 2-5 nervatum producta; pili crassi obtusi (raro acuti) 0.1-0.4(-0.5) mm. Stylus 2.5-3.2 mm longus crassiusculus erectus ramis subulatis circa 1 mm. Ovaria obovato-oblonga triangulata dorso plano-convexa basi acuta 1.8-2 x 0.8 mm. Achaenia nigricantia obtuse triangulata vel fere laevia oblongo-obovata apice rotundato basi acuta 2 mm longa 1 mm lata.

Flores disci masculi 10-21 in capitulo. Corolla lutea 4-4.8 mm, tubulo 1.6-1.8 mm longo praecipue sursum pilis patulo-ascendentibus acutis vel obtusis 0.2-0.8 mm longis et sparsis glandulis pediculatis munito, limbo tubuloso campanulato basi sparsis pilis et glandulis, dentibus triangularibus acutis 0.5-0.6 mm longis marginibus incrassatis longeque papillosis dorso parcis pilis patulis et copiosis glandulis sessilibus vel subsessilibus instructis. Antherae 1.6-1.8 mm basi breviter sagittatae appendicibus apicalibus late ovatis subacutis 0.4 mm longis. Stylus circa 4.5 mm longus crassus apice conico-dilatato dense papilloso. Nectarium tubulosum obtuse angulatum 5-denticulatum 0.7-0.8 mm longum.

Typus: Colombia. Boyacá: Leiva, vereda de Capilla, encima del km 21, en el monte, 2640 m. alt.; tallo liso de 4 m alt x 6 cm diam que culmina en tres cortas ramificaciones, flores amarillas, 2-XII-1970, Lorenzo Uribe Uribe 6491;

holotypus, US. Ibidem, vereda de Capilla, monte sobre km. 21, 2640 m, mata 6 m, tallo muy duro bifurcado a 1 m sobre el suelo, cada rama terminada en cortas ramificaciones apicales, inflorescencias erguidas con flores amarillas. Crece en matorral alto. 2-XII-1970, Lorenzo Uribe Uribe 6492; paratypus, US. Boyacá: Arcabuco, al NE de la población, cerca límite con Santander, 2650 m; 4 m, erecta, tallo 5 cm diam, nervios foliares color oro, pelos amarillos, flores amarillas; cuando se corta se ramifica; 12-X-1966, H. García Barriga 18764; paratypus, US.

ESPELETTIA JABONENSIS Cuatr. sp. nov.

Acaulirosula densissime foliosa 30-50 cm alta 45-65 cm lata visu albo-cinereo-sericea nitens. Caudex lignosus sub-tuberosus pyriformis 6-10 cm longus basi radice axonomorpha crassa brevi cum ramulis radialis robustis instructa.

Lamina foliorum coriacea rigidula, 14-30 cm longa 3-7 (-10) mm lata, stricte linearis levissime oblanceolata acutaeque basin versus sine sensu attenuata margine valde revoluta, supra pilis longis sericeis intricatis valde adpressis vestimentum laevem nitidum argentatum formantibus tecta, subtus costa crassa elevata dense adpresseque villosa-sericea lucidaque reliqua superficie adpresse lanato-sericea. Vagina 2-2.5 cm longa 5-8 mm lata adaxiali facie sursum lanato-villosa reliqua glabra, abaxiali dense longeque sericeo-villosa.

Inflorescentia terminalis thyrsiforme paniculata valde floribunda 40-80 cm alta 25-35 cm lata, axe robusto ad basin 20-30 mm diametro, striato purpurascenti sed spisse albido-villoso-lanato, dense folioso foliis inferne linearibus acutis sericeis rosulantibus similimis, sursum gradatim minoribus (20-10 cm x 8-4 mm) e basi copiosissime ramoso. Rami erecti robustiusculi rigiduli aphylli dense albo lanato-sericei extremo simplice vel duplicato corymbosi (3-) 6-15 capitula ferentes, 10-30 cm longi superiores gradatim minores; folia subtendentia linearia villosa-sericea quam rami valde breviora sed circa apicem aequilonga. Pedunculi pepedicellive 0.5-3.5 cm longi erecti sericeo-villoso-lanati, bracteis subtendentibus brevioribus, sub apicem parvis bracteolis alternis linearibus acutis purpurascensibus et albo-villoso-lanatis 20-12 mm longis 1-1.5 mm latis ad involucrum adjacentibus instructis.

Capitula radiata erecta vel reclinata circulo ligularum 25-35(-40) mm disco 10-14 mm diametentibus, 184-250 flores ferentia. Involucrum cupulatum 12-16 mm diametro dense longeque villosa-lanatum albo-cinereum, phyllariis sterilibus 16-28 bi-triseriatis linearibus vel lineari-subulatis interioribus magis lanceolatis acutis vel subacutis gradatim decrescentibus 11-6 x 1.2-2(-2.5) mm extus copiose longeque villosa-vellereis; phyllariis interioribus fertilibus lanceolatis acutis (8-) 6.5 x 1.5-2.5 mm extus marginibusque villosis, saepe etiam sparsis minutis glandulis pediculatis praeditis. Receptaculum planum

7-10 mm diametiente sparse pilosum pilis tenuibus erectis ad 0.8 mm longis. Paleae radii 5-4 x 1.1-2 mm late lanceolatae vel oblongo-lanceolatae acutae subamplectentes, interiores magis tenues amplectentesque costa signata marginibus hyalinae et sursum pilosae. Paleae disci lanceolatae oblongae acutatae amplectentes saepe naviculares 4-5 x 1.5-2 mm marginibus late hyalinis dorso firmo et extremo pilis copiosis antrorsis sub-acutis vel subobtusis 0.3-0.5 mm longis et parvis glandulis subglobosis pediculatis instructis.

Flores marginales feminei ligulati 52-86 in capitulo 3-seriati. Corolla lutea vel luteolo-aurantiaca 8-13 mm longa tubulo 1.2-2.2 mm longo stricto copiose piloso pilis patulo-antrorsis hyalinis subobtusis vel acutis seu obtusis 0.3-0.4 (-0.8) mm longis interdum parvis glandulis pediculatis vel subsessilibus praedito, apice saepe appendice adaxiali minuto dentiformi vel elongato lineari curvato ad 1 mm longo raro duplo; lamina lineari vel oblonga basi aperta apice 2-3-dentata 1-1.8(-2) mm lata 4-8-nervata supra minute papillosa velutina subtus sparsis vel sparsissimis pilis 0.2-0.3 mm longis et interdum parvis minutis glandulis munita sed ad basim semper pilis copiosioribus instructis. Stylus 3.5-5 mm longus ramis 1.2-1.5 mm crassiuscule lanceolatis. Achaenia atra exteriora obovoidea triquetra apice rotundata basi cuneata breviter callosa dorso convexo 1.8-2 x 1.3-1.5 mm, interiora oblonga basim attenuata subquadrangulata dorso subcostato 2-2.2 x 1 mm.

Flores disci pseudohermaphroditi 110-154 in capitulo. Corolla lutea 4.5-5.5 mm longa, tubulo 2-2.3 mm hirtulo pilis subpatulis 0.3-0.6 mm saepe parvis glandulis subglobosis pediculatis vel subsessilibus munito, limbo tubuloso-campanulato subglabro dentibus triangularibus 0.8-1.2 mm longis acutis marginibus papillosis extus parvis pilis patulis 0.3-0.4 mm et interdum raris glandulis subsessilibus praeditis. Antherae oblongae 1.7-2 mm basi sagittatae apice appendice ovata acutata 0.35-0.4 mm. Stylus circa 5 mm. Nectarium 0.7-0.8 mm longum crassiusculum tubulosum leviter quinquedentatum.

Typus: Venezuela, Trujillo: Tres Pozos, sector del Páramo del Turmal, 2800-3850 m, 14.4 km al E de Carache; acaulirrósula 50 cm alto, 65 cm diam, hojas blanco-plateado-seríceas en ambas caras; inflorescencia terminal 45 cm alto 28-35 cm diam, capítulos 3-4.5 cm diam total, disco 14 mm diam; lígulas y flósculos amarillo a amarillo anaranjado claro; dominante en la localidad pero contados individuos en flor, 8-VI-1971 colect. Luis Ruiz-Teran & Manuel López-Figueiras 1995. Holotypus US, isotypus MER. Trujillo: Páramo de Cendé, Hoya de Los Carruzos, cerca de Cerro de Los Muertos, distrito Carache, 2900 m; acaulirrósula 33 cm alta 45 cm ancha, inflorescencia terminal 60 cm, capítulos 35-38 mm diam total, disco 13-15 mm diam, involucro subhemisférico 14-16 mm diam, lígulas amarillas o amarillo-anaranjado claras; dominante en la localidad pero escasa en flor, colect. 10-VI-1971 Luis Ruiz-Teran & Manuel López-Figueiras 2101; paratypi, US, MER. Another collection: Páramo

de El Jabón, 3100-3400 m alt, vertiente oriental; rósula, hoja argentada muy brillante, restos de inflorescencias secas, 2-XI-1969, J. Cuatrecasas, L. Ruíz-Terán & M. López-Figueiras 28217 (US, MER).

ESPELETTIA RUIZII Cuatr. sp. nov.

Rosula dense foliata virescens, circa 30 cm alta 65 cm diametro, breviter stipitata. Lamina foliorum coriacea rigida, 20-30 cm longa, 6-10(-12) mm lata, anguste lanceolato-linearis apicem gradatim attenuata acutataque, basim versus sensim sine sensu angustata basi 4-3 mm lata, margine revoluta; supra primo laxe sericeo-villosa pilis longis et longissimis parallelis ascendentibus subadpressis munita deinde (praeter basim villosolanuginosam) glabrata subnitenti-viridis laevis tantum costa impressa notata; subtus costa crasse elevata nervis secundariis patulis prominentibus 1.5-2.5 mm inter se distantibus nervulis minoribus prominente reticulatis, primum cum indumento superficiali laxo villosa subsericeo pilis longis et longissimis deciduis vestita sed costa persistente subsericeo-villosa, reliqua cum dense crasseque indumento albo intricato-lanato persistenti tecta. Vagina foliorum subtrapezoidea apice paulo attenuato in adultis subrotundato, basi latiori truncata multinervata facie adaxiali apice excepto glabra, abaxiali dense adpresse longeque albo-villosa-sericea margine sursum apiceque longe sericeo-barbata, 27-35 mm longae 22-33 mm latae. Folia initialia gemmae terminalis dense adpresseque albo-subsericeo-villosa.

Inflorescentia terminalis magna subcorymbiforme paniculata quam rosula foliorum circa duplo longior et latior. Axis robustus ad basim circa 5 cm diametro medullosus sursum gradatim angustatus fistulosus angulatus striatusque ex basi ramosus ramis alternis ascendentibus usque 30, proximalibus longioribus ad 65 cm longis centrales attingentibus. Axis ramique epidermide rubiginosa cum indumento densiusculo villosa albo pilis longis et longissimis tenuibus subsericeis ascendentibus deinde intricatis aspectu lanato-barbatis tecti. Folia caulina subtendentia rosulantia similia sed sursum gradatim breviora et indumento externo gossypino magis copiosis vaginis latis amplexentibus carneis vel rubris. Ramuli ultimi quam priores semper strictiores dense albo-vellereo-barbati, subterminales graciles 3-10 cm longi alterni vel suboppositi foliis subtendentibus subaequilongis, terminales cymosi dichasiales vel monochasiales saepe ramulo mediali brevi vel brevissimo cum capitulo terminato, lateralibus longioribus etiam floriferis, bracteis subtendentibus supremis pedicellos 0.5-6 cm longos superantibus vel attingentibus patulis saepe infra capitula radiatis. Lana alba sericeo-barbata inter bracteas pedunculos et calathia valde copiosa.

Capitula radiata erecta vel inclinata, 80-100 flores ferentia, circulo ligularum 16-22 mm diametienti cum phyllariis involucri exterioribus stellatis valde superato, disco convexo 10-12 mm diametienti. Involucrum herbaceum cupulatum dense

longeque albo-lanato-barbatum, phyllariis sterilibus biseriatis exterioribus 7-9 oblongo-lanceolatis acuminatis extremo radiatis flores valde excedentibus, 14-9.5 mm longis 4-3.5 mm latis, interioribus 2-4, late lanceolatis 9.5-8 mm longis 4.5-3 mm latis, facie adaxiali viridibus leviter nervatis subglabris extus albissime copioseque barbato-lanatis; phyllariis intimis fertilibus tenuioribus ovato-lanceolatis acutis acuminatis plus-minusve arcuatis praecipue sursum longe villosis, 8-7.5 x 3.5 mm. Receptaculum convexo-subconicum 5-6 mm diametro glabrum. Paleae exteriores femineae oblongae subacutatae curvatae subamplectentes circa 6 x 2 mm ad apicem copiose pilosae ciliataeque pilis obtusis. Paleae disci oblongae acutae amplectentes 5-7 paralleli-nervatae costula prominenti, dorso praecipue sursum pilosae barbatae pilis crassiusculis obtusis (clavatis) 0.4-0.8 mm longis.

Flores marginales feminei ligulati 32-36 in capitulo tri-seriati. Corolla 5.2-7 mm longa; tubo 1.7-1.9 mm copiosis pilis patulis minutis crassiusculis capitato-glandulosis 0.06-0.08 mm longis et raris pilis clavatis 0.4-0.5 mm, apice appendice adaxiali minuta obtuse 1-2-dentata callosa instructo; lamina eburnea deinde lutescenti vel apicem versus aurantiaca vel rosea, elliptico-oblonga obtusa bi-tridentata 5-7 nervata circa 2(1.8-3) mm lata supra glabra subtus sparsis minutis glandulis munita. Stylus 4-4.5 mm longis ramis sublanceolatis 1-1.2 mm longis. Achaenia nigricantia exteriora deltoidea argute tri-angulata 2 x 1.6 mm, interiora subquadrangulata 2.3 x 1.3 mm, omnia basi acutissima.

Flores disci pseudohermaphroditi 48-64 in capitulo. Corolla rubescenti 5.4-5.7 mm longa; tubulo crassiusculo circa 2 mm longo sparsis glandulis pediculatis et rarissimis pilis longioribus munito; limbo tubuloso-campanulato praecipue ad basim et sursum sparse glanduloso et sparsissimis pilis clavatis 0.4-0.5 mm praedito, dentibus triangularibus acutis crasse papillo-seque marginatis 1-1.2 mm longis. Stylus circa 6 mm longus ad apicem dense breviterque papilloso-pilosus. Antherae 2 mm longae basi obtusiuscule sagittatae, appendice apicali oblongo-ovata 0.4-0.5 mm longa. Stylus circa 6 mm longus apice dense breviterque papilloso-pilosus. Nectarium tubulosum 1 mm altum breviter 5-denticulatum.

Typus: Venezuela, Mérida: Páramo de Las Coloradas, Loma de la Libertad, 2750-2800 m, a unos 500 m de El Portachuelo (El Ramal) entre Santa Cruz de Mora y El Molino, municipio Estanques, distrito Sucre, "Caulirrosuleto, roseta 30 cm alta 65 cm diám., hojas verde intensas sublucientes haz, panícula corimbosa terminal 105 cm diám, vainas foliares caulinares, ejes y ramas inflorescenciales rosados o vinosos cubiertos con indumento lanoso-algodonoso, blanco, seríceo; lígulas cremosas tornándose amarillentas y anaranjadas o rosadas siquiera en los ápices; flósculos rojizo vinosulos." 16 enero 1971 colect. Luis Ruiz Terán & Manuel López Figueiras 1457. Holotypus US; isotypus MER.

ESPELETIA ULOTRICA Cuatr. sp. nov.

Acaulirosula parva albo-lanata 15-20 cm lata 10-15 cm alta. Caudex brevi ad 5 cm longus subterraneus crassus vel tuberosus (3-4 cm diametro) radice robusta acuta brevi sed ramosa ramulis crassiusculis divergentibus.

Folia coriacea linearia crasse albo-lanato vestita tacto valde mollia, in sicco cinerascens vel roseata vel rufescentia. Lamina anguste linearis subobtusata basim versus sine sensu attenuata et in vaginam paulo ampliata producta 8-22 cm longa 5-10 mm lata (sed cum indumento 10-14 mm lata et apice obtuso), basi 5-7 mm lata (cum indumento 7-10 mm); supra epidermide minute rugulosa tantum nervo medio impresso apparente; subtus margine revoluta costa valde crassa notata alteris nervis in reticulum minutum prominentem anastomosatis, alveolis cum lana minuta candidissima repletis, sed omni architectura laminae cum maximo indumento crispo-lanato crassissimo subdensa extus plusminusve arachnoideo cancellata. Vaginae oblongae apice subrotundatae basi paulo angustatae nervato-striatae 20-43 mm longa 6-10 mm latae facie adaxiali glabrae virescentes abaxiali dense longeque sericeo-barbata. Folia initialia gemmae terminalis crasse densissimeque niveo-sericeo-villosa.

Inflorescentiae axillares scapiformes 1-5 quam rossula 2-3-plo longiores. Scapi 1-3-cephali erecti vel curvati 15-60 cm longi subteneri sed ob indumento crispo lanato denso visu crassiores, circa basim 1-4 foliis alternis linearibus 4-10 cm longis densissime albo-lanatis instructis, saepe duobus foliis inferioribus adjacentibus vaginis uno latere connatis; sursum etiam parvis foliis gradatim minoribus instructis, supremis bracteiformibus 1-2 cm longis capitulum non vel vix attingentibus. Indumentum scaporum crispo-lanatum superficie plusminusve araneosum, album sed ad extremos et in capitulis fulvum.

Capitula radiata cernua 300-500 flores ferentia circulo ligularum 40-45 cm diametientia, disco circa 20 mm diametro. Involucrum cupulatum 20-25 mm latum, complanatum 40 mm diametro, alborufescens, phyllariis herbaceis 19-28 sterilibus 3-4-seriatis lanceolato-subulatis acuminatisque 20-12 mm longis 2.2-1.4 mm latis densissime longe crasseque albo-lanatis, phyllariis intimis fertilibus subulatis 12-10 mm longis 1.8-1.2 mm latis extus dense longeque villosis barbulatisque. Receptaculum plano-convexum 10-15 mm diametro hirsutulum pilis tenuibus sericeis erectis 0.5-3.5 mm longis dense praeditum. Paleae exteriores femineae oblongo-lanceolatae acutae subamplectentes 6.5-7 x 1-1.4 mm costa viridula marginibus hyalinis dorso apiceque copiose villosae. Paleae disci hyalinae oblongae acutae amplectentes costa et sursum longe erecto-pilosae, 6-6.8 x 1.3-1.5 mm. Pili paleae stricti acuti erecti 1-1.5 mm longi.

Flores radii feminei ligulati 70-140 in capitulo tri-seriati. Corolla lutea 14-18 mm longa; tubo 1.5-2.3 mm longo apice appendice adaxiali dentiformi vel lineari 0.5-1.2 mm longa, copiose piloso pilis crassiusculis obtusis vel

longioribus acutis, 0.2-0.5 mm longis, patulis vel curvato-antrorsis et sparsis glandulis globosis stipitatis; lamina lineari obtusiuscula minute obtuseque 2-3-dentata, 1.7-2 mm lata, 7-6-nervata supra minutissime epidermo-papillosa extus glandulis globosis subsessilibus sparsis et pilis sparsissimis basim versus copiosioribus munita. Stylus 5.5-6 mm longus ramis lanceolatis crasse marginatis 2-2.5 mm longis. Ovaria obovato-oblonga basi acuta exteriora triangulata 2.5 x 1.4 mm, interiora quadriangulata 2.7-2.8 x 1.2 mm.

Flores disci pseudohermaphroditi 180-360 in capitulo.

Corolla lutea 6-7 mm longa; tubulo 2-2.5 mm longo sursum sparsis pilis crassiusculis minutis obtusis 0.1-0.3 mm longis; limbo tubuloso tantum basi parvis pilis, dentibus oblongo-triangularibus acutis 1 mm longis crasse papilloseque marginatis apice papilloso extus glandulis globosis et saepe raris (1-4) pilis praeditis. Antherae 2.3 mm longae subobtusae sagittatae, appendice apicali oblongo-ovata subacuta 0.4-0.5 mm longa. Stylus circa 7 mm longus extremo dense breviterque papilloso-pilosus. Nectarium tubulosum crassiusculum minute denticulatum 0.5-0.6 mm longum.

Typus: Venezuela, Lara: Páramo del Jabón vertiente oriental, 3400 m alt, en lo alto junto al límite con el estado de Trujillo; rosulas pequeñas de porte blanco, hoja blanda densamente blanco lanuda todo alrededor; escapos monocéfalos o raramente 2-3-céfalos, densamente blanco-lanudos, en el extremo mas o menos leonados asi como el capítulo, lígulas y flósculos amarillos; 2-XI-1969 colect. J. Cuatrecasas, L. Ruiz-Terán & M. López-Figueiras 28220; holotypus US, isotypus MER. Lara-Trujillo: Páramo de El Jabón en Los Pocitos de El Alto (15 km al E de Carache, Trujillo) 3100 m; Acaulirrosuleto, hojas densamente lanosas en ambas caras, escapos axilares 1-céfalos, a veces 2-3-céfalos, capítulos péndulos, lígulas y flósculos amarillos; 2-X-1970, L. Ruiz-Terán & M. López-Figueiras 929; paratypus US, MER.

ADDITIONAL NOTES ON THE GENUS VERBENA. XIII

Harold N. Moldenke

VERBENA [Dorst.] L.

Additional & emended bibliography: Macer Floridus, De Virib. Herb., pr. 2, xxxiii--xxxv. 1490; Brunf., Herb. Viv. Icon., ed. 1, 1: 119, 120, & [267] (1530) and ed. 2, 1: 119, 120, & [267]. 1532; Macer, Herb. Virib. 133--135, 164, 167, & 199--200. 1581; Gerarde, Herb., ed. 1, 580--582, fig. 1 & 2 (1597) and ed. 2, 717--719, fig. 1 & 2. 1633; Ray, Hist. Pl. 2: 1336 & [1967]. 1693; Sauzé & Maillard, Fl. Dép. Deux-Sèvres, ed. 1, 2 (2): 26. 1880; Thomé, Fl. Deutschl. 4: 171--173, pl. 531. 1889; Sanders, Encycl. Gard., ed. 2, 409--410. 1897; Druce, Fl. Berks. 390 & 641. 1898; Chadwick, N. Y. State Mus. Bull. 124: 150. 1908; Felt, N. Y. State Mus. Bull. 124: 408 (1908) and 200: 181--182, 225, & 309. 1917; H. H. Thomas, Round Year Gard., ed. 2, pr. 1, 122 (1920), ed. 2, pr. 2, 122 (1923), and ed. 2, pr. 3, 122. 1926; Sanders, Encycl. Gard., ed. 19, 447--449. 1930; Macself in Sanders, Encycl. Gard., ed. 21, pr. 1, 456--457 & 459. 1931; G. Klein, Handb. Pflanzenanal. 2 (1): 505 & 968 (1932), 3 (1): 574, 583, 614, 616, 635, 640, 644, 647, & 664 (1932), 3 (2): 932 (1932), and 4 (2): 867, 873, & 1860. 1933; Macself in Sanders, Encycl. Gard., ed. 21, pr. 2, 456--457 & 459. 1934; Nemoto, Fl. Jap. Suppl. [Nipp. Shokub. Soran-hoi] 626. 1936; Takenouchi, Journ. Nat. Hist. Fukuoka 2: 15. 1936; Macself in Sanders, Encycl. Gard., ed. 21, pr. 3, 456--457 & 459 (1938), ed. 21, pr. 4, 456--457 & 459 (1942), and ed. 21, pr. 5, 456--457 & 459. 1945; Schnack & Covas, Darwiniana 7: [71]--79, pl. 1--5. 1945; Covas & Schnack, Darwiniana 7: 85--86, fig. 1 & 2. 1945; Macself in Sanders, Encycl. Gard., ed. 21, pr. 6, 456--457 & 459. 1946; Prased, Indian Forest. 75: 38. 1949; Hellyer in Sanders, Encycl. Gard., ed. 22, pr. 1, 456--457 & 459 (1950), ed. 22, pr. 2, 506--508 (1952), and ed. 22, pr. 3, 506--508. 1956; Letty, Dyer, Verdoorn, & Codd, Wild Fls. Transv. 280 & 281. 1962; Anon., Cat. Sem. Hort. Bot. Univ. Valent. 27. 1963; Anon., Delect. Sem. Hort. Bot. Cent. Thbilis. Georg. 25. 1966; Hutchins, Sida 3: 182. 1967; Battersby, Hall, & Southgate, Journ. Chem. Soc. Lond. Sec. C 5: 721--728. 1969; Raman, Curr. Sci. 38: 579--580. 1969; Raju, Bull. Bot. Soc. Bengal 23: [69] & 70. 1969; S. P. & R. N. Banerjee, Bull. Bot. Soc. Bengal 23: 168. 1969; Macer, Virib. Herb., ed. 2, pr. 2, [86]--[88]. 1970; J. Harris Co. [Rochester, N. Y.], Care Home Gard., rev. ed., 21, 23, & 32. 1970; Anon., Hort. Abstr. 40: 809. 1970; Schmelzer, Phytopath. Zeit. 67: 309. 1970; Anon., Hortic. Abstr. 41: 1108 & 1117. 1971; Anon., Zierpflanzenbau 11: 187--189. 1971; Khoshoo & Arora, Am. Hort. Mag. 50: 16--18, fig. 1--5. 1971; Cadbury, Hawkes, & Readett, Comput.-map. Fl. Warwicksh. 197. 1971; G. E. Tucker, Castanea 37: 23. 1972; Moldenke, Phytologia 23: 257--303. 1972; A. L. Moldenke, Phytologia 23: 317 & 318. 1972; Hinton & Rzedowski, Journ. Arn. Arb. 53: 167. 1972.

The Druce (1898) work, cited above, although dated "1897" on

its title-page, was not actually published until 1898, according to an author in Journ. Bot. 36: 104 (1898).

Beutemueller (1907) reports the itonid "vervain leaf midge", Itonida verbenae Beutm., attacking members of the genus Verbena; Felt (1911) reports the itonid, Cecidomyia sp. and the same authority (1908) reports another itonid, Lestodiplosis verbenifolia Felt, from this genus. The vervain leaf midge causes marginal leaf rolls; the first-mentioned of Felt's itonids causes irregular oval stem galls, 3--5 mm. long, and the second is probably predaceous in rolled leaves.

Parks (1937), in speaking of V. quadrangulata Heller, notes that "There are twenty-two other species of verbena within the state [of Texas]. These range from annuals through perennials and through color from white to deep blue. A number of these have been taken into cultivation and can be purchased from seed stores. Some of the blue-flowered species produce quite large and showy spikes of flowers but as yet have not become common in cultivation. Those wishing to try new flowers should attempt the cultivation of the wild verbenas found within their own territories."

VERBENA AMBROSIFOLIA Rydb.

Additional synonymy: Glandularia ambrosifolia Schnack & Covas, Darwiniana 7: [71], in textu. 1945.

Additional & emended bibliography: Schnack & Covas, Darwiniana 7: [71]. 1945; Moldenke, Phytologia 23: 258. 1972.

Additional citations: NEW MEXICO: Sierra Co.: Spellenberg & Todsén 2543 (N).

VERBENA BONARIENSIS L.

Additional bibliography: Macself in Sanders, Encycl. Gard., ed. 21, pr. 1, 457 (1931), ed. 21, pr. 2, 457 (1934), ed. 21, pr. 3, 457 (1938), ed. 21, pr. 4, 457 (1942), ed. 21, pr. 5, 457 (1945), and ed. 21, pr. 6, 457. 1946; Hellyer in Sanders, Encycl. Gard., ed. 22, pr. 1, 457 (1950), ed. 22, pr. 2, 506 & 507 (1952), and ed. 22, pr. 3, 506 & 507. 1956; Moldenke, Phytologia 23: 259, 265, 289, 290, 292, & 293. 1972.

VERBENA BRACTEATA Lag. & Rodr.

Additional bibliography: Anon., Cat. Sem. Hort. Univ. Valent. 27. 1963; Moldenke, Phytologia 23: 259. 1972; A. L. Moldenke, Phytologia 23: 317. 1972.

VERBENA CANADENSIS (L.) Britton

Additional bibliography: Macself in Sanders, Encycl. Gard., ed. 21, pr. 1, 457 (1931), ed. 21, pr. 2, 457 (1934), ed. 21, pr. 3, 457 (1938), ed. 21, pr. 4, 457 (1942), and ed. 21, pr. 5, 457. 1945; Schnack & Covas, Darwiniana 7: [71]. 1945; Macself in Sanders, Encycl. Gard., ed. 21, pr. 6, 457. 1946; Hellyer in Sanders, Encycl. Gard., ed. 22, pr. 1, 457 (1950), ed. 22, pr. 2, 506 & 507 (1952), and ed. 22, pr. 3, 506 & 507. 1956; Schmelzer, Phyto-

path. Zeit. 67: 309. 1971; Moldenke, Phytologia 23: 259--260 & 265. 1972.

VERBENA COMONDUENSIS Moldenke

Additional bibliography: Moldenke, Phytologia 23: 193. 1972.

Additional citations: MEXICO: Baja California: Moldenke & Moldenke 25407 (Ws).

VERBENA CRITHMIFOLIA Gill. & Hook.

Additional & emended bibliography: Schnack & Covas, Darwiniana 7: [71], 72, 74, & 75. 1945; Moldenke, Phytologia 23: 260 & 271. 1972.

Bolkhovskikh & his associates (1969) cite the Darlington & Wyllie (1956) reference in the bibliography of this species as "Darlington, Chrom. Numb. Flow. Pl. 1955".

VERBENA GOODINGII Briq.

Additional bibliography: Moldenke, Phytologia 23: 234--237. 1972.

Holmgren found this species "locally common" on rocky basalt slopes. The corolla is described as having had its "tube pale-yellow, lobes blue" on N. H. Holmgren 3308.

Additional citations: ARIZONA: Mohave Co.: N. H. Holmgren 3308 (N).

VERBENA HASTATA L.

Additional & emended bibliography: Felt, N. Y. State Mus. Bull. 200: 182. 1917; Moldenke, Phytologia 23: 261--268. 1972; G. E. Tucker, Castanea 37: 23. 1972.

Tucker (1972) records this species from Ashe County, North Carolina.

VERBENA HOOKERIANA (Covas & Schnack) Moldenke

Additional & emended bibliography: Schnack & Covas, Darwiniana 7: [71] & 72. 1945; Moldenke, Phytologia 23: 270--271. 1972.

xVERBENA HYBRIDA Voss

Additional synonymy: Verbena hybrida cv. drandiflora Hort. ex Anon., Delect. Sem. Hort. Cent. Thbil. Georg. 25, sphalm. 1966.

Additional bibliography: Sanders, Encycl. Gard., ed. 2, 409--410 (1897) and ed. 19, 447--449. 1930; Macself in Sanders, Encycl. Gard., ed. 21, pr. 1, 456--457 & 459 (1931), ed. 21, pr. 2, 456--457 & 459 (1934), ed. 21, pr. 3, 456--457 & 459 (1938), ed. 21, pr. 4, 456--457 & 459 (1942), ed. 21, pr. 5, 456--457 & 459 (1945), and ed. 21, pr. 6, 456--457 & 459. 1946; Hellyer in Sanders, Encycl. Gard., ed. 22, pr. 1, 456--457 & 459 (1950), ed. 22, pr. 2, 506--508 (1952), and ed. 22, pr. 3, 506--508. 1956; Anon., Delect. Sem. Hort. Bot. Cent. Thbilis. Georg. 25. 1966; Raman, Curr. Sci. 38: [579]--580. 1969; J. Harris Co. [Rochester, N. Y.], Care Home Gard., rev. ed., 21, 23, & 32. 1970; Anon., Hortic. Abstr. 40: 809 (1970) and 41: 1108 & 1117. 1971; Anon.,

Zierpflanzenbau 11: 187--189. 1971; Khoshoo & Arora, Am. Hort. Mag. 50: 16--18, fig. 1, 3, & 5. 1971; Moldenke, Phytologia 23: 271--278. 1972; A. L. Moldenke, Phytologia 23: 318. 1972.

Additional illustrations: Khoshoo & Arora, Am. Hort. Mag. 50: 16--18, fig. 1, 3, & 5. 1971.

An anonymous writer (1971) gives germination percentages and notes on seedlings and seedling development from pelleted seeds of this plant. Raman (1969) states that the absorption spectrum of the acetone extract from a purple corolla showed 3 peaks in the green-blue, green, and yellow regions, a characteristic of florachrome.

An additional horticultural variety offered is

Ruffled White (Burpee) — a "superb sweetly scented variety producing large well-filled trusses of pure white flowers so freely that the display has the appearance of a white carpet"; represented by Burpee seed no. 3177.

VERBENA INCISA Hook.

Additional bibliography: Sanders, Encycl. Gard., ed. 2, 409. 1897; Moldenke, Phytologia 23: 278--280 & 300. 1972; A. L. Moldenke, Phytologia 23: 318. 1972.

VERBENA LACINIATA (L.) Briq.

Additional bibliography: Macself in Sanders, Encycl. Gard., ed. 21, pr. 1, 457 (1931), ed. 21, pr. 2, 457 (1934), ed. 21, pr. 3, 457 (1938), ed. 21, pr. 4, 457 (1942), ed. 21, pr. 5, 457 (1945), and ed. 21, pr. 6, 457. 1946; Hellyer in Sanders, Encycl. Gard., ed. 22, pr. 1, 457 (1950), ed. 22, pr. 2, 506 & 507 (1952), and ed. 22, pr. 3, 506 & 507. 1956; Raman, Curr. Sci. 38: [579]. 1969; Moldenke, Phytologia 23: 282--284. 1972.

The "Verbena erinoides" and "Verbena ericoides" of Macself (1931--1946) and of Hellyer (1950--1956) are almost certainly V. tenuisecta Briq.

VERBENA LITORALIS H.B.K.

Additional bibliography: Moldenke, Phytologia 23: 270 & 288--295. 1972; Hinton & Rzedowski, Journ. Arn. Arb. 53: 167. 1972.

VERBENA LITORALIS var. ALBIFLORA Moldenke

Additional bibliography: Moldenke, Phytologia 23: 294. 1972; Hinton & Rzedowski, Journ. Arn. Arb. 53: 167. 1972.

VERBENA MACDOUGALII Heller

Additional bibliography: Moldenke, Phytologia 23: 265 & 297--298. 1972.

The Holmgrens describe this species as "locally common along roadsides in ponderosa pine forests".

Additional citations: ARIZONA: Coconino Co.: Holmgren & Holmgren 4691 (N).

VERBENA MENTHAEFOLIA Benth.

Emended synonymy: Verbena hintonii Moldenke, Alph. List Inval-

id Names Suppl. 1: 24, in syn. 1947; Hinton & Rzedowski, Journ. Arn. Arb. 53: 167. 1972.

Additional bibliography: Moldenke, Phytologia 23: 301--303. 1972; Hinton & Rzedowski, Journ. Arn. Arb. 53: 167. 1972.

VERBENA MICROPHYLLA H.B.K.

Additional synonymy: Glandularia microphylla Schnack & Covas, Darwiniana 7: [71], 72, & 74, pl. 3 D, in textu. 1945.

Additional & emended bibliography: Schnack & Covas, Darwiniana 7: [71], 72, & 74, pl. 3 D. 1945; Moldenke, Phytologia 23: 303. 1972.

Emended illustrations: Schnack & Covas, Darwiniana 7: pl. 3 D. 1945.

Material has been misidentified and distributed in some herbaria as Geranium sp. On the other hand, the Mutis 1919, distributed as V. microphylla, is actually V. ciliata Benth., Mutis 3691 is V. trifida H.B.K., and A. S. Hitchcock 21737, Pachano 144, and Rose & Rose 22400 are Hierobotana inflata (H.B.K.) Briq.

Additional citations: ECUADOR: Chimborazo: D. H. Knight 401 (Ws). PERU: Puno: Vargas Calderón 20883 (Ac). CHILE: Santiago: Zöllner 3070 (Lk). ARGENTINA: Tucumán: Olea 236 (N).

VERBENA MINUTIFLORA Briq.

Synonymy: Verbena minutiflora "Briq. ex Moldenke" apud Angely, Fl. Anal. Paran., ed. 1, 572. 1965.

Additional bibliography: Angely, Fl. Anal. Paran., ed. 1, 572. 1965; Moldenke, Phytologia 16: 98, 101, & 102. 1968; Angely, Fl. Anal. Fitogeogr. Est. S. Paulo, ed. 1, 4: 840 & xix, map 1395. 1970; Moldenke, Fifth Summ. 1: 178 & 190 (1971) and 2: 684 & 917. 1971; Moldenke, Phytologia 23: 293. 1972.

The corollas on Hatschbach 22483 are described as having been "lilac" in color when fresh.

Additional citations: BRAZIL: Paraná: Hatschbach 22483 (Rf); Reitz & Klein 17805 (N, W—2548334). Rio Grande do Sul: Rambo 45339 (Au—122317, Au—122321, Go). Santa Catarina: Smith & Klein 13469 (N).

xVERBENA MOECHINA Moldenke

Additional synonymy: Verbena urticifolia angustifolia Bebb, in herb.

Additional bibliography: Moldenke, Phytologia 16: 101--102. 1968; Moldenke, Fifth Summ. 1: 34--39, 44, 45, 47, 53, & 371 (1971) and 2: 522, 651, 672, 679, 695--698, 708, & 917. 1971; Moldenke, Phytologia 23: 265. 1972.

Additional citations: ILLINOIS: Winnebago Co.: M. S. Bebb s.n. [Fountaindale] (Pa). MISSOURI: Saint Louis: Drummond s.n. [St. Louis, N. Am.] (Au—122287); Eggert s.n. [Prairies, Sept. 1891] (Pa); Engelmann s.n. [St. Louis, July 1842] (Au—122722).

VERBENA MONACENSIS Moldenke

Additional bibliography: Moldenke, Phytologia 10: 157—158. 1964; Moldenke, Fifth Summ. 1: 371 (1971) and 2: 917. 1971.

VERBENA MONTEVIDENSIS Spreng.

Additional & emended bibliography: Cabrera, Fl. Alred. Buenos Aires 395 & 397. 1953; Darlington & Wylie, Chrom. Atl., pr. 1, 323. 1956; Schnack, Fehleisen, & Cocucci, Revist. Fac. Agron. La Plata 35: [47], 49, [54], & 55, fig. 3. 1959; Darlington & Wylie, Chrom. Atl., pr. 2, 323. 1961; Angely, Fl. Anal. Paran., ed. 1, 571 & 572. 1965; Troncoso in Cabrera, Fl. Prov. Buenos Aires 5: 128 & 131. 1965; Moldenke, Phytologia 16: 98, 101, & 102. 1968; Moldenke, Résumé Suppl. 16: 7. 1968; Bolkh., Grif, Matvej., & Zakhar., Chrom. Numb. Flow. Pl. 717. 1969; Moldenke, Fifth Summ. 1: 49, 178, 188, 190, 201, & 371 (1971) and 2: 917. 1971; Moldenke, Phytologia 22: 489 (1972) and 23: 293 & 295. 1972.

Additional illustrations: Schnack, Fehleisen, & Cocucci, Revist. Fac. Agron. La Plata 35: [54], fig. 3. 1959.

Recent collectors have found this plant growing in old fields and in fertile soil of low campos. Montes reports that it is rather abundant in Misiones, Argentina, where it is also used in popular medicine ("de sabor muy amargo"). Additional vernacular names (besides those previously reported by me) for the plant are "berbena" and "verbena", and it has been encountered at 1800 m. altitude in Salta. It has been collected in fruit (in addition to the months previously reported) in April, July, and October. Montes refers to it as an "annual-biennial herb". The corollas are described as having been "blue" on Aguilar 88, Guimarães 99, Ibarrola 1898, J. E. Montes 765, 14719, & 14731, Olea 198, T. Rojas 11882, Ruiz Huidobro 2087, and G. J. Schwarz 624, "violet" on G. J. Schwarz 821, Stellfeld 1525, and Troncoso 357, and "white" on A. G. Schulz 6134. Risso 263 is anomalous.

The Gallinal, Aragone, Bergalli, Campal, & Rosengurt 1269, Herb. Herter 95525, Lindman A.3651, T. Rojas 11660, and Rosengurt A.1241 & B.507, previously cited by me as V. litoralis H.B.K., seem more probably to represent V. montevidensis instead. The R. Alvarez 951 and W. A. Archer 4788, first cited by me as V. litoralis and now as V. litoralis var. caracasana (H.B.K.) Briq., have much the general appearance of large-spiked V. montevidensis. Their status needs more intensive investigation.

Troncoso (1965) says of V. montevidensis: "Originaria del Uruguay y región mesopotámica vecina. Abunda en praderas higrófilas, borde de zanjás y cercos". She cites from Buenos Aires only Cabrera 6298 and Pastore s.n. [Herb. San Isidro 1147], as well as Macbride's type photograph 17432. Schnack and his associates (1959) report that this plant is apomictic in its reproduction.

Material has been misidentified and distributed in some herbaria as V. brasiliensis Vell.

Additional citations: LOUISIANA: Avoyelles Par.: J. K. Small s.

n. [Burkie, May 1931] (N, N, N, N, Rf). Ouachita Par.: Thomas, .
Thomas, & Thomas 708 (N). BRAZIL: Paraná: Guimarães 99 [Herb. Fac.
 Farmácia 5779] (W—2527766); Hatschbach 12075 (Ac), 14731 (N, Rf),
 27659 (Ac, N); Stellfeld 1525 [Herb. Fac. Farmácia 5868] (W—
 2527750). Rio Grande do Sul: Palacios & Cuezzo 283a (N), 994 (N).
 PARAGUAY: Lindman A.3651 (N). URUGUAY: H. H. Bartlett 20689 (N),
 21301 (N); Gallinal, Aragone, Bergalli, Campal, & Rosengurt 1269
 (N); Herb. Herter 95525 (N); Rosengurt A.1241 (N), B.507 (N).
 ARGENTINA: Buenos Aires: R. Alvarez 311 (N), 453 (N), 609 (N),
 746 (N), 779 (N); A. T. Hunziker 2305 (W—2595170); Nicora 377 (W—
 2595171); Troncoso 357 (W—2595174). Catamarca: Pierotti "h", in
 part (N); Risso 263 (N). Chaco: Aguilar 88 (N); T. Rojas 11660
 (N), 11882 (N). Córdoba: T. Meyer 12915 (N). Corrientes: Ibar-
rola 1898 (N); Ruiz Huidobro 2087 (N). Entre Ríos: F. Y. Geof-
froy 48 (N). Formosa: I. Morel 2188 (N), 3072 (N), 3203 (N),
 3385 (N), 4107 (N), 4982 (N), 5132 (N), 5243 (N), 6464 (N). Men-
 doza: A. G. Schulz 6134 (N). Misiones: Krapovickas, Cristóbal,
Pire, & Tressens 15302 (Ac), 15322 (Rf); J. E. Montes 765 (N),
 1237 (Se—130263), 14719 (N, N), 14731 (Au—271308), 27659 (Au—
 271283, W—2556187); G. J. Schwarz 624 (N), 821 (N), 6340 (N).
 Salta: Pierotti 1025 (N). Santa Fé: R. Alvarez 973 (N). Tucumán:
Borsini 901 (N); F. Ortiz 23 (N), s.n. [30/5/45] (N).

VERBENA MORICOLOR Moldenke

Synonymy: Glandularia moricolor Schnack & Rubens, Bol. Soc. Ar-
 gent. Bot. 13: 205, hyponym. 1970.

Additional bibliography: Moldenke, Phytologia 11: 473. 1965;
 Schnack & Rubens, Bol. Soc. Argent. Bot. 13: 205. 1970; Solbrig,
 Princ. & Meth. Pl. Biosystem. 76. 1970; Moldenke, Fifth Summ. 1:
 201 (1971) and 2: 521 & 917. 1971.

VERBENA MORICOLOR Moldenke x V. PERUVIANA (L.) Britton

Bibliography: Solbrig, Princ. & Meth. Pl. Biosystem. 76. 1970;
 Moldenke, Fifth Summ. 2: 917 & 970. 1971.

Solbrig (1970) describes the artificial hybridization of these
 two species as well as the hybridization of V. megapotamica
Spreng. with V. peruviana: "Crosses between G[landularia] peruvia-
na and two other morphologically distinct species, G. megapotamica
and G. moricolor, on the other hand, yielded hybrids that were
 more fertile. The cross between G. peruviana and G. megapotamica,
 for example, was approximately 60 percent pollen fertile and the
 cross between G. peruviana and G. moricolor was approximately 80
 percent pollen fertile. Morphologically, G. megapotamica is simi-
 lar to G. peruviana although it has flowers of a different color
 and is more erect. Glandularia moricolor, on the other hand, is
 quite distinct, having elliptic leaves, erect habit, smaller and

deep purple flowers, and a more compact inflorescence. Neither of these two species grows together with G. peruviana. Glandularia megapotamica grows in the subtropical gallery forest of northeastern Argentina, Brazil, and Paraguay, whereas G. moricolor is a species of the margins of the subtropical forest of northern Argentina. Consequently, the genetic isolation between these two species and G. peruviana is not complete. However, they are effectively isolated reproductively because they do not grow together."

As yet I have not seen any herbarium material as vouchers for the putative hybrid, and the statement about the similarity in habit between V. megapotamica and V. peruviana leads me to wonder about the accuracy of the identification of one or the other of the two plants used in the crosses. Because of this uncertainty I have not as yet named the V. moricolor hybrid referred to above. The hybrid between V. megapotamica and V. peruviana, on the other hand, has been called xV. schnackii Moldenke.

VERBENA MULTICAULIS Raf.

Additional bibliography: Moldenke, *Phytologia* 11: 473. 1965; Moldenke, *Fifth Summ.* 1: 66 (1971) and 2: 793 & 917. 1971.

VERBENA MULTIGLANDULOSA Moldenke

Additional bibliography: Moldenke, *Phytologia* 16: 102. 1968; Moldenke, *Fifth Summ.* 1: 193 (1971) and 2: 917. 1971.

VERBENA NANA Moldenke

Synonymy: Glandularia nana Schnack & Rubens, *Bol. Soc. Argent. Bot.* 13: 205, *hyponym.* 1970.

Additional bibliography: Angely, *Fl. Anal. Paran.*, ed. 1, 572. 1965; Moldenke, *Phytologia* 13: 211. 1966; Angely, *Fl. Anal. Fito-geogr. Est. S. Paulo*, ed. 1, 4: 840 & xix, map 1395. 1970; Schnack & Rubens, *Bol. Soc. Argent. Bot.* 13: 205. 1970; Moldenke, *Fifth Summ.* 1: 178, 188, & 201 (1971) and 2: 917. 1971.

Rojas describes this species as 30--40 cm. tall and found it growing on rocky riverbanks in Paraguay.

Additional citations: PARAGUAY: T. Rojas 13872 (N). ARGENTINA: Formosa: I. Morel 3295 (N), 3754 (N).

VERBENA NEOMEXICANA (A. Gray) Small

Additional & emended synonymy: Verbena canescens var. neo-mexicana A. Gray, *Syn. Fl. N. Am.*, ed. 1, 2 (1): 337. 1878. Verbena neomexicana Perry ex Moldenke, *Fifth Summ.* 2: 684, in syn. 1971. Verbena neomexicana (A. Gray) Small ex Moldenke, *Fifth Summ.* 2: 685, in syn. 1971.

Additional bibliography: Howell & McClintock in Kearney & Peebles, *Ariz. Fl.*, ed. 2, 726 & 728. 1960; Lewis & Oliv., *Am. Journ. Bot.* 48: [639] & 641, fig. 18. 1961; Hocking, *Excerpt. Bot.* A.6: 91. 1963; Moldenke, *Phytologia* 16: 189 & 200. 1968; Whittaker & Niering, *Journ. Ecol. [Brit.]* 56: 528. 1968; Bolkh., *Grif*, Matvej., & Zakhar., *Chrom. Numb. Flow. Pl.* 717. 1969; Rickett,

Wild Fls. U. S. 3 (2): 365, [367], & 551, pl. 111 (1969) and 4 (3): 540, [543], & 799, pl. 177. 1970; Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. Bot. 6:] 1876 & 1877. 1970; Moldenke in Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. Bot. 6:] 1315 & 1321. 1970; Moldenke, Fifth Summ. 1: 20, 30, 59, 62, 63, 66, 76, 371, & 396 (1971) and 2: 659, 672, 683--685, 687, 705, 707, & 917. 1971; Moldenke, Phytologia 22: 485 & 500 (1972) and 23: 192, 236, 242, & 302. 1972.

Illustrations: Rickett, Wild Fls. U. S. 3 (2): [367], pl. 111 (in color) (1969) and 4 (3): [543], pl. 177 (in color). 1970.

Recent collectors describe this plant as erect, becoming 4 inches to 1 foot tall about bushes, growing in deserts, in roadside washes, and on silty slopes. Stewart found it "common on dry hillsides" in Coahuila, Mexico. Kruckeberg found it to be "common" in campground areas in oak-pinyon-juniper associations in Brewster County, Texas. Whittaker & Niering (1968) found it growing "to some extent" on limestone in southeastern Arizona, while in the same state Howell & McClintock (1960) describe it as "common" on foothills and in canyons at altitudes of 2000 to 6000 feet, flowering from March to October.

In addition to months previously reported by me, it has been collected in fruit in April and June. The corollas are described as having been "lavender" on Kruckeberg 4796, "blue" on R. M. Stewart 402, and "purple" on Johnston & Muller 1057 & 1067 and Powell, Turner, & Magill 2063.

The M. Mitchell s.n. [4/14/37] distributed as V. neomexicana is actually V. bracteata Lag. & Rodr.; Atwood 2008, Ballinger s.n. [October 24, 1959], and C. M. Rowell 5113 are V. canescens var. roemeriana (Scheele) Perry; A. Davis 32 is V. gooddingii Briq.; W. W. Jones s.n. [Aug. 10, 1926] is V. gracilis Desf.; Leverich 22, E. Marsh 249, B. Pittman 36, and C. M. Rowell 11635 are V. neomexicana var. hirtella Perry; W. W. Jones s.n. [Cabullona], Kruckeberg 4928 (in part), and S. S. White 3310 are V. neomexicana var. xylopoda Perry; Kruckeberg 4928 (in part) is V. menthaefolia Benth.; C. H. Muller 8214 and C. M. Rowell 11147 are V. perennis Wooton; Pennington 74 is V. pinetorum Moldenke; and Meebold 26696 is V. racemosa Eggert.

Additional citations: TEXAS: Brewster Co.: Kruckeberg 4796 (N); C. H. Mueller 8138 (Ik). Jeff Davis Co.: Tharp & Janszen 49-1144 (Au--122363). NEW MEXICO: Grant Co.: E. L. Greene s.n. [August 11, 1880] (W--2606263), s.n. [Pinos Altos Mtns., August 23, 1880] (Pa). MEXICO: Chihuahua: Powell, Turner, & Magill 2063 (Au-296948). Coahuila: Johnston & Muller 193 (Au--301900, Mi), 1057 (Au--301851), 1067 (Mi); R. M. Stewart 402 (Au--301426).

VERBENA NEOMEXICANA var. HIRTELLA Perry

Additional synonymy: Verbena neomexicana hirtella Perry apud Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. 6:] 1876. 1970.

Additional & emended bibliography: Lewis & Oliv., Am. Journ. Bot. 48: [639]—641, fig. 18. 1961; Hocking, Excerpt. Bot. A.6: 91 (1963) and A.9: 365. 1965; Moldenke, Phytologia 16: 189. 1968; Moldenke in Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. Bot. 6:] 1315 & 1321. 1970; Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. Bot. 6:] 1876. 1970; Moldenke, Fifth Summ. 1: 20, 59, 62, 63, & 76 (1971) and 2: 683, 685, & 917. 1971; Moldenke, Phytologia 23: 192 & 242. 1972.

Emended illustrations: Lewis & Oliv., Am. Journ. Bot. 48: 640, fig. 18. 1961.

Recent collectors have found this plant growing among limestone rocks. Youngblood calls it an "herb locally frequent in rocky sand" in Brewster County, Texas. The corollas are described as having been "purple" on D. Youngblood 40 and "blue-purple" on Leverich 22. Material has been misidentified and distributed in some herbaria under the name V. neomexicana Perry. On the other hand, the J. H. Thomas 8185, distributed as V. neomexicana var. hirtella, is (in at least some herbaria) actually V. canescens var. roemeriana (Scheele) Perry, as is also G. L. Webster 453, while Tharp & Janszen 49-1144 is typical V. neomexicana (A. Gray) Small.

Additional citations: TEXAS: Brewster Co.: Leverich 22 (Lk); E. Marsh 249 (Au—214401); E. G. Marsh 684 (Au—212535); B. Pittman 36 (Lk); C. M. Rowell 11635 (Lk); D. Youngblood 40 (Lk). Jeff Davis Co.: Tharp & Janszen 49-1144 (N). MEXICO: Durango: Johnson & Johnson 1718 (Ws).

VERBENA NEOMEXICANA var. XYLOPODA Perry

Additional bibliography: Howell & McClintock in Kearney & Peebles, Ariz. Fl., ed. 2, 728. 1960; Moldenke, Phytologia 16: 102 & 103. 1968; Rickett, Wild Fls. U. S. 4 (3): [543], pl. 177. 1970; Moldenke in Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. Bot. 6:] 1315 & 1321. 1970; Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. Bot. 6:] 1877. 1970; Moldenke, Fifth Summ. 1: 30, 59, 63, 66, & 76 (1971) and 2: 659, 685, 707, & 917. 1971; Moldenke, Phytologia 23: 302. 1972.

Illustrations: Rickett, Wild Fls. U. S. 4 (3): [543], pl. 177 (in color). 1970.

Recent collectors describe this plant as a perennial herb, 1 m. tall, and found it growing on ridges, in sandy pockets of clay flats, in juniper-grassland associations, and in riparian habitats. Kruckeberg found it in openings of woodlands consisting of Quercus arizonica, Q. hypoleuca, and Pinus leiophylla. Howell & McClintock (1960) describe it as having "slightly glandular inflorescence and a larger corolla than [the] typical form" and note that "This is the chief Arizona representative of the species". The corollas are said to have been "blue" on S. S. White 3099 & 3310, "lavender-blue" on R. V. Moran 14592, and "purple" on Gentry & Fox 11735. Moran describes the plant as "scarce".

Material of this variety has been misidentified and distributed in some herbaria as V. xutha Lehm. On the other hand, the R. Runyon 2611, distributed as V. neomexicana var. xylopoda, is V. cloverae Moldenke, while R. Runyon 4869 seems to be a mixture of V. cloverae and V. plicata Greene.

Additional citations: ARIZONA: Cochise Co.: Pinkava, Keil, & Lehto 14553 (N, N). Yavapai Co.: W. S. Lewis s.n. [Herb. Blake 956] (Ld). MEXICO: Baja California: Gentry & Fox 11735 (Mi); R. V. Moran 14592 (Sd--68132), 15095 (Sd--68464). Chihuahua: Krueck-eborg 4928 (N); Townsend & Barber 192 (Au--292061). Sonora: W. W. Jones s.n. [Cabullona] (Sd--41133); S. S. White 3099 (Sd--61803), 3310 (Sd--61804). Tamaulipas: Stamford, Lauber, & Taylor 2381 (Se--147631).

xVERBENA NEQUAM Moldenke

Additional bibliography: Moldenke, *Phytologia* 11: 473. 1965; Moldenke, *Fifth Summ.* 1: 371 (1971) and 2: 521, 666, 678, 700, & 917. 1971.

xVERBENA NISA Moldenke

Additional bibliography: Moldenke, *Phytologia* 11: 473--474. 1965; Moldenke, *Fifth Summ.* 1: 371 (1971) and 2: 522, 689, 700, & 917. 1971.

VERBENA NIVEA Moldenke

Additional bibliography: Moldenke, *Phytologia* 13: 211--212. 1966; Moldenke, *Fifth Summ.* 1: 184 & 201 (1971) and 2: 685 & 917. 1971.

VERBENA NIVEA f. ROSEA Moldenke

Additional bibliography: Moldenke, *Phytologia* 13: 212. 1966; Moldenke, *Fifth Summ.* 1: 201 (1971) and 2: 685 & 917. 1971.

xVERBENA NOACKI Moldenke

Additional bibliography: Moldenke, *Phytologia* 10: 192. 1964; Moldenke, *Fifth Summ.* 1: 371 (1971) and 2: 673, 674, & 917. 1971.

xVERBENA NOTHA Moldenke

Additional bibliography: Moldenke, *Phytologia* 11: 474. 1965; Moldenke, *Fifth Summ.* 1: 371 (1971) and 2: 672, 685, & 917. 1972.

VERBENA OCCULTA Moldenke

Additional bibliography: J. F. Macbr., *Field Mus. Publ. Bot.* 13 (5): 614, 615, & 627. 1960; Moldenke, *Phytologia* 11: 471. 1965; Moldenke, *Résumé Suppl.* 16: 5 (1968) and 17: 3. 1968; Anon., *Biol. Abstr.* 50 (3): B.A.S.I.C. S.201. 1969; Moldenke, *Biol. Abstr.* 50: 1493. 1969; Hocking, *Excerpt. Bot. A.* 15: 422. 1970; Moldenke, *Fifth Summ.* 1: 144 (1971) and 2: 917. 1971; Moldenke, *Phytologia* 22: 466 (1972) and 23: 284. 1972.

Recent collectors have found this plant growing in rocky-sandy

soil, flowering in March, June, and July (in addition to the months previously reported by me), and fruiting in August. They describe it as a shrub 3 feet tall. Fosberg calls it a "low much branched herb, common on jalca or mountain meadow". The corollas are described as having been "blue" on Edwin & Schunke 3692, "violet" on Aguado 6761, "white-violet" on López Guillén 3787, and "white to purple" on F. R. Fosberg 28192.

Material has been misidentified and distributed in some herbaria as V. berterii (Meisn.) Schau. and V. laciniata (L.) Briq. The Ferreya 6586, cited by Macbride (1960), is the type collection of f. alba Moldenke.

Additional citations: PERU: Amazonas: Edwin & Schunke 3692 (N); Soukup 4960 (W--2565565). Cajamarca: F. R. Fosberg 28192 (Ac). La Libertad: Aguado 6761 (Tp). Lima: López Guillén 3787 ["3387"] (Ac).

VERBENA OCCULTA f. ALBA Moldenke

Additional bibliography: J. F. Macbr., Field Mus. Publ. Bot. 13 (5): 627. 1960; Moldenke, Phytologia 10: 194. 1964; Moldenke, Fifth Summ. 1: 144 (1971) and 2: 917. 1971.

Vargas Calderón found this plant growing at 2000--2600 m. altitude, in flower and fruit in October.

Additional citations: PERU: Ancash: Vargas Calderón 10276 (W--2520241).

VERBENA OCCULTA f. AURANTIACA Moldenke

Bibliography: Moldenke, Phytologia 17: 344. 1968; Moldenke, Résumé Suppl. 17: 3. 1968; Anon., Biol. Abstr. 50 (3): B.A.S.I.C. S.201. 1969; Moldenke, Biol. Abstr. 50: 1493. 1969; Hocking, Excerpt. Bot. A.15: 422. 1970; Moldenke, Fifth Summ. 1: 144 (1971) and 2: 917. 1971.

Citations: PERU: La Libertad: Angulo 1383 (Z--type).

VERBENA OFFICINALIS L.

Additional & emended synonymy: Verbena vulgo appellata Anguill., SEMPL. 266. 1561. Verbenaca volgare del Matthioli Pona, Pl. Simp. Bald. Mont. 3. 1595. Verbenaca recta Dodon., Stirp. Hist. Pemptad., ed. 2, 150. 1616. Verbena lusitanica, latifolia, procerior Tourn., Compl. Herb. 357. 1719. Verbena urticae-folia, canadensis, foliis incisis, flore majore Tourn., Compl. Herb. 357. 1719. Verbena communis caeruleo flore Tourn. ex Manetti, Virid. Florent. 98. 1751. Verbena vulgaris Hill, Brit. Herb. 356 & [536]. 1756. Verbena foliis tripartitis, rugosis, spicis nudis gracillimis Haller, Hist. Stirp. Ind. Helv. 1: 96--97. 1768. Verbena tetrandra spicis filiformibus paniculatis, foliis multifido laciniatis, caule solitario L. ex Haller, Hist. Stirp. Ind. Helv. 1: 96. 1768. Verbenaca Camer. apud J. E. Sm., Engl. Fl., ed. 1, 3: 71, in syn. 1825. Tetrandra, spicis filiformibus paniculatis, foliis multifido-

laciniatis caule solitario Willd. ex Lanfrossi, Giorn. Fis. Chim. Stor. Nat. Med. & Art., ser. 2, 10: 48. 1827. Verbena communis caeruleo flore (foliis dissectis) Micheli ex Bertol., Fl. Ital. 6: 261, in syn. 1844. Verbena communis caeruleo flore Zannich. ex Bertol., Fl. Ital. 6: 261, in syn. 1844. Verbena vulgo appellata Ang. ex Bertol., Fl. Ital. 6: 260, in syn. 1844. Verbenaca volgare del Matthioli Pon. ex Bertol., Fl. Ital. 6: 260, in syn. 1844. Verbena communis, flore caeruleo Cip. ex Bertol., Fl. Ital. 6: 260, in syn. 1844. Verbena n. 219 Haller ex Bertol., Fl. Ital. 6: 261, in syn. 1844. Verbena spura L. ex Jacobs & Burlage, Ind. Pl. N. C. 251, sphalm. 1958. Verbena officinalis L. ex R. I. Patel, For. Fl. Melghat 353, sphalm. 1968. Verbena officinalis Cham. ex Angely, Fl. Anal. Fitogeogr. Est. S. Paulo, ed. 1, 4: 839, sphalm. 1970.

Additional & emended bibliography: Virgil., Eccl. 8: v. 64--65. 37 B.C.; Propertius, Elegies 4 (3): v. 57--58. 26 B.C.; Virgil., Aeneid 12: v. 119--120. 19 B.C.; Plin. Secund., Hist. Mund. Nat. lib. 22, cap. 2. 77 A.D.; Macer Floridus, De Virib. Herb., ed. 1, ff. xxxiii--xxxv (1477) and ed. 2, pr. 1, ff. xxxiii--xxxv. 1490; Macer, Virtut. Herb., ed. 1, "k"--[ki]. 1506; Brunf., Herb. Viv. Icon., ed. 1, 1: 119, 120, & [267] (1530) and ed. 2, 119, 120, & [267]. 1532; Fuchs, Hist. Plant. Basil. 592--593. 1542; Anguill., SEMPL. 266. 1561; Macer, Virtut. Herb., ed. 2, [t7]. 1581; Macer, Herb. Virib. 133--135, 164, 167, & 199--200. 1581; Matth., Disc. Valgr., ed. 1, 2: 399 & 1107. 1585; Durante, Herb. Nuov., ed. Roma., 469. 1585; Camer. in Matth., Pl. Epit. Util. 797. 1586; Matth., Disc. Valgr., ed. 2, 2: 1107. 1586; Pona, Pl. Simp. Bald. Mont. 3. 1595; Matth., Herb. Aneb Bylinar 380--381. 1596; Gerarde, Herb., ed. 1, 580--582, fig. 1. 1597; Dodon., Stirp. Hist. Pemptad., ed. 2, 149--151. 1616; Gerarde, Herb., ed. 2, 717--719, fig. 1. 1633; J. Schröder, Pharm. Med.-Chem., ed. 2, 4: 167--168. 1649; J. Schröder, Chymic. Dispens. 1669; Lonic., Kreuterb., pr. 1, 310--311. 1679; Rivin., Ord. Pl. Irreg. Monop. 81, pl. 56. 1690; Cupani, Hort. Cathol. 227. 1696; Tourn., Inst. Rei Herb., ed. 2, 2: 200, pl. 94. 1700; Tourn., Compl. Herb. 357--359 & 618. 1719; Tourn., Inst. Rei Herb., ed. 3, 2: 200, pl. 94. 1719; A. Haller, Enum. Meth. Stirp. Helv. Indig. 1: 660--661. 1742; Segui-er, Pl. Veron. 1: 312. 1745; Micheli, Cat. Plant. Hort. Caes. Florent. 98 & 182. 1748; L., Mat. Med., ed. 1, 6 & 208. 1749; Manetti, Virid. Florent. 98. 1751; Segui-er, Pl. Veron. Suppl. 142. 1754; J. Hill, Brit. Herb. 356. 1756; Kalm, Resa Nor. Am. 2: 248. 1756; Kalm, Beschrieb. Reise Nörd. Am. 2: 267. 1757; L., Sp. Pl., ed. 2, 29. 1762; L., Gen. Pl., ed. 6, 14. 1764; Crantz, Inst. Rei Herb. 1: 573. 1766; A. Haller, Hist. Stirp. Indig. Helvet. 1: [96]--97, 183, & 202. 1768; Kalm, Travels N. Am., ed. 1, 1: 119. 1770; Schreb. in L., Mat. Med., ed. 2, pr. 1, 38 & [272]. 1772; [Retz.], Nom. Bot. 11. 1772; Kalm, Travels N. Am., ed. 2, 1: 93. 1772; Scop., Carniol., ed. 1, 1: 433. 1772; O. F. Müll. in Oeder, Icon. Pl. Fl. Dan. 4: 5, pl. 628. 1775; Sabbat in Martelli, Hort. Roman. 3: 10--11, pl. 56. 1775; W. Curtis, Fl. Lond., ed. 1, 1

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Recent collectors have found this plant growing in sandy soil, disturbed areas, waste ground, and clearings in evergreen forests. They describe it as a typical ruderal plant. Koelz refers to it as 18 inches to 5 feet tall. Manning (1965) describes its fruit as consisting of four reddish-brown 1-seeded nutlets each weighing about 0.0004 gm., dispersed in mud or (in the calyx) adhering to the coats of animals or to clothing. Bolkhovskikh and his associates (1969) point out that the diploid number of chromosomes for *Verbena officinalis* is given as 12 by Schnarf (1923) and by Patermann (1935), but as 14 by Junell (1934), Tischler (1934), Dermen (1936), Noack (1937), and Schnack & Covas (1944). Hsu (1967) says that at diakinesis there are seven bivalents.

The color of the corolla is given as "pale-lilac" by Paque (1902) and Sauzé & Maillard (1872), "rose" on Koelz 15757, "rose-lavender" on Koelz 16144, "rose-purple" on Koelz 16839, "purple-blue" on Beauchamp 1178, "pale-blue" on E. H. Walker 8101, "light-purple" on Banerjee & Shakya 5596, "mauve" on E. A. Robinson 5596, "bluish-purple" on A. Smith 211, "purple" on R. E. Cooper 5045 and A. Smith 50 and by Gupta (1967), "violet" by Deb, Sen-gupta, & Malick (1968), "lilac" by Bouloumoy (1930), Banerji (1965), and Patzak & Rechinger (1967), and "white with bluish tinge" by Kapoor (1968).

The time of blooming is given as July by Gattinger (1894) in Tennessee, "May to Autumn" by Tornabene (1891) in Italy, June to October by Polunin (1969) in Europe, by Sauzé & Maillard (1880)

in Belgium, and by Heimans, Heinsius, & Thijssse (1965) in the Netherlands, June to September by Martin (1965) in England and Wales and by Zukowski (1967) in Poland, June to November by Ohwi (1965) in Japan, July to September by Tatnall (1946) in Delaware, Sauzé & Maillard (1872) in Belgium, Dietrich (1824) in Germany, Martens & Kemmler (1882) in Württemberg, and Thomé (1888) in Germany, July to October by Druce (1897) in England, March to June by Datta & Majumdar (1966) in India, and April to October by Maheshwari (1963) in India.

Additional vernacular names applied to this plant, in addition to the many previously reported by me, are "akicamiyu gusa", "akimayō", "akitsumayō", "beneran", "bé-pin-chháu", "birbina", "blood of Mercury", "briina", "brivina", "bukexrem", "bunj", "colombaria", "Dankbarkraut", "devil's bane", "devil's hate", "Eisenrich", "Eiserisch", "enchantment herb", "erba bona", "erba colombina", "erba croce", "erba crocetta", "erba crocina", "erba medica", "erba sacra", "erba S. Giovanni", "European verbenae", "gebräuchlicher Eisenhart", "gemeiner Eisenhart", "gogerchin otu", "herbal vervain", "herba sacra", "herba veneris", "hierba de todos los males", "holy plant", "horse-whip", "Isenkraut", "karatā", "kuma-tsu-zura", "kumatuzura", "Männlin", "mā tiên tháo", "officinis", "peristereon", "peristereum", "simplers' joy", "spike vervain", "spurious vervain", "Taubenkraut", "tears of Juno", "té-bí-chháu", "thin-bé-pin", "verbena officinal", "verbenae herba", "vermena", "vermenaca", "verminaca", and "verveine sauvage".

Stewart (1967) informs us that this species is a very common weed in lower Swat, Pakistan. Carleton (1962) records the additional vernacular names "countryman's treacle" [a name also applied to Ruta graveolens], "hyssop" [also applied to Gratiola officinalis, Hyssopus officinalis, and Teucrium pseudohyssopus], "tears-of-Isis", and "tears-of-Juno". He tells us that the name "herb-grace", applied to Verbena officinalis, is likewise applied to Ruta graveolens, the name "shrubby-verbena" is applied also to members of the genus Lantana, and "sweet-scented-verbena" to Aloysia triphylla (L'Hér.) Britton. Miall (1969) states that "primitive medicine gave the name of....Verbena to Verbena officinalis and to the groundsel". Hatton (1909) reminds us that to the ancients "Verbena was the name used for a sacrificial herb, whatever it was". Polunin & Huxley (1966) report that "Hippocrates considered this to be one of the few all-curing herbs".

Uphof (1968) avers that Verbena officinalis is an "Annual or perennial herb. Origin uncertain, probably from the Mediterranean region, escaped throughout Europe, Africa, Asia, Australia, N. and S. America. Was in ancient times well known. Was called in ancient Egypt 'Tears of Isis'. The entire plant, Herba Sancta, was burned during ceremonies. At present Herba Verbenae is used as astringents, diuretic, diaphoretic; for its action on the uterus and as emmenagogue. Externally employed for wounds that are difficult to heal, ulcers and skin ailments."

Beston (1950) informs us that "There grows in the garden here a very ancient plant which has been a part of the magic and relig-

ion of the most diverse European cultures, in England being a sacred plant of the Druids, in Scandinavia a plant of the priests of Thor, in Greece and Rome a plant so holy that no other might be used to brush the altars of Olympian Jove. Yet it is not a stately plant but a quite simple one, almost a thing of the roadsides and the fields. 'Hierobotane' the Greeks called it, the 'Holy Plant'; and 'Herba Sacra' the Romans. To us it is Spike or Herbal Vervain, the Verbena Officinalis of Linnaeus. Whatever list of annuals I make for the garden, this ancient herb is sure to be written down. It has enough garden presence of a rustic kind to justify its inclusion, being in no way boorish or uncivil, and it is easy to start from seed and easy to grow....Seed....is still used in domestic medicine as a help in the early stages of colds and fevers.....to be had....only from European firms. The herb is not particular about soil but likes a sunny place, and I have put my plants well back in the border, planting them in a close-growing line, and facing them with some shorter and more compact perennial. To those interested in magic and religion, there is no herb in the garden more worthy of attention, for this simple plant without fragrance, without an outer look of power, without a flower of significance, was singled out from among all other plants and herbs as the most sacred of the growing things of earth between the Pillars of Hercules and the roots of the Caucasus."

Clair (1961) gives us another fascinating account of this plant:

"Bring your garlands, and with reverence place
The vervain on the altar. BEN JONSON

Strange that a herb of such insignificant appearance should have held so important a place in mankind's estimation through long centuries; but it was a sacred and magic herb in Persia, in ancient Greece and Rome, and in ancient Britain, where the Druids had a special reverence for it, ordering it to be gathered about the rising of the great dog star, but only when neither the sun nor moon were above ground at the time to see it. Moreover, those who uprooted it were expected to place upon the spot where it had grown honey in the comb to make amends for having deprived the earth of so holy a herb.

"The Greeks called it *hiera botane*, or Holy Herb, and in France to this day Vervain is popularly called *Herbe sacrée*. From time immemorial it was the symbol of enchantment, for white and against black magic. In philtres it engendered love, and was one of the plants dedicated to Venus, for did not Venus *Victrix* wear a crown of Myrtle interwoven with Vervain? The Romans purified their houses with it to ward off evil spirits, and with it they swept the altars of their gods.

"Like Dill, it possessed the power of overcoming the spells of the sorcerer, being ' 'gainst witchcraft much avayling'. Edith Wheelwright tells us that the Welsh in the Middle Ages called it 'Devil's Bane', and after cutting it in the dark, brought it into the churches to use as a sprinkler of holy water.

"The Romans were great observers of the custom of New Year's

gifts, and those royal colleagues Romulus and Tatius ordained that every year Vervain should be offered to them with other gifts as an augury of good fortune for the coming year.

"Vervain has always taken an important place in herbal medicine since the days of Dioscorides. It was considered efficacious in cases of scrofula, and Lupton, in his Book of Notable Things (1660), says 'the root of Vervain hanged at the neck of such as have the king's evil, it brings a marvellous and unhoped help'. It was also held to be a cure for the ague and in that curious book of Dr John Schroder, the Chymical Dispensatory (1669), we read that 'some cure Tertians and Quartans peculiarly therewith: in the Tertian they take the third joynt from the Earth and gather it by pulling it upward and give it to be drunk; and in a Quartan the fourth joynt.' This I fancy the good doctor cribbed from Dioscorides. But, as Gerard says: "many odde old wives fables are written of Vervaine."

The common names, "Pigeon's grass", "columbine", etc., were applied to this plant because doves were said to be fond of hovering around it. "As an herbe of good omen Vervain was one of those associated with the Eve of St John, and in an old book called Ye Popish Kingdome appears the following couplet:

'And young men round about with maides doe dance in every streete,
With garlands wrought of Mother-wort, or else with Vervaine
sweete.'

.....It is slightly aromatic when bruised....In taste it is bitter and contains a glucoside, verbenalin, which is employed in herbal medicine as a febrifuge and in nervous complaints. Some say that as an anti-thermic it compares favorably with quinine...

'Here holy vervayne and here dill,

'Gainst witchcraft much availing.'

The Muses' Elysium.....

'Trefoil, Vervain, John's Wort, Dill,

Hinder witches of their will.'.....

'Whosoever weareth Vervin or Dill

May be bold to sleep on every hill."

Coon (1963) explains that "The constituent which brings Verbena into the medical field is a bitter glucoside and tannin, a simple infusion (2 teaspoons to 1 pint) being employed as a diaphoretic, tonic, and expectorant. There are, in herbal literature, no strong claims made for its efficacy.....An exploration of the story of vervain leads us down some ancient avenues and provides an explanation for belief in the efficacy of the plant in herbal medicine. This plant was first used by the Romans. They gave us the name 'verbena', which to them meant any one of a number of plants used in sacrifices, purgation and supplications. Finally the name was attached to one particular plant, and the virtues ascribed to Verbena by the Romans were passed along through the centuries, until, in the Middle Ages, it was said to have been a plant which, growing on the Mount of Calvary, staunched the wounds of the Saviour. The transferral of virtues from pagan to Christian (it has happened in our Christmas celebrations) was not unusual, and ver-bena early became one of the holy herbs associated with St. John."

[to be continued]

CHEILOTHELA VAGINATA AND SYRRHOPODON STEYERMARKII

TWO NEW MOSS SPECIES FROM VENEZUELA

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Examination of recent Venezuelan collections has revealed the following two very distinctive species of mosses.

Cheilothela vaginata H.Robinson, sp. nov. (Figs. 1-3).

Planta dioica? dense caespitosa pallide viridis inferne sordida. Caules usque ad 4 cm longi simplices vel parce ramosi. Folia caulina e basi late oblonga vaginata superne abrupte anguste linearia erecto-patentia ca. 2.5 mm longa 0.8 mm lata, margine minute crenulata erecta; nervis prope basin 65μ latis, ad apicem subulatis indistincte; cellulis basilaribus angustis $8-12\mu$ latis ad $40-95\mu$ longis laevibus pellucidis, mediis et superioribus bistratos quadratis $7 \times 7-14\mu$ vel brevioribus oblongis ad extrema amba papillosis.

Venezuela. Estado Mérida: a 2 kms de la Ciudad de Mérida, sobre rocas, sitio húmedo. elev. 2,500 m, 22 Feb. 1971, Nora Farfa 1 (US, holotype; D.Griffin, isotype).

The bistratose lamina and the protruding cell ends of the leaf relate the new species to the common Cheilothela chilensis (Mont.) Broth. of the Dominican Republic, the Andes south to Chile and of New Zealand and Kerguelen. The leaf base of the new species is entirely different in being broadly vaginate and the plant has a superficial resemblance to Dicranella vaginata (Hook.) Card.

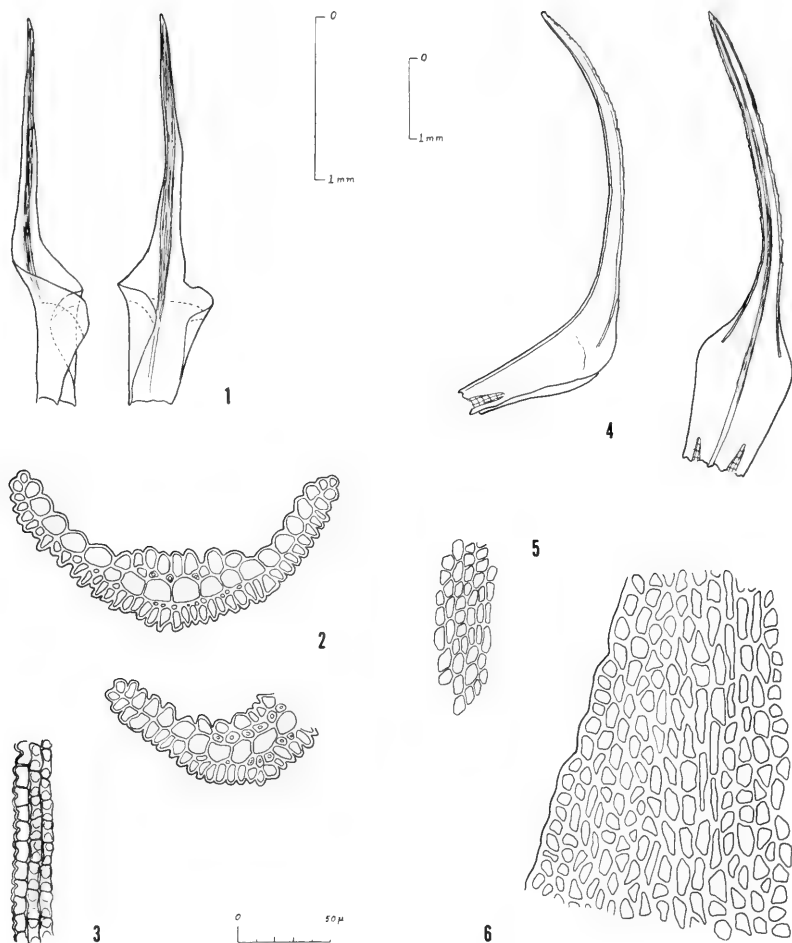
Syrrhopodon steyermarkii H.Robinson, sp. nov. (Figs. 4-6).

Planta dioica? laxe caespitosa sordide viridis inferne fulvescens. Caules usque ad 8 cm longi simplices vel parce ramosi. Folia caulina e basi late ovata vaginata superne sensim lineari-lanceolata erecto-patentia 6-7 mm longa ca. 1.3 mm lata, margine superne multistratosa argute duploserrata erecta; nervis prope basin ca. 100μ latis, superne percurrentibus laevibus; cellulis cancellinarum paucis ca. 15μ latis $35-40\mu$ longis; cellulis basilaribus plerumque rhomboideis vel oblongis $7-12\mu$ latis $12-50\mu$ longis flavorubrescentibus, parietibus nodulosis; cellulis superioribus quadratis vel breviter oblongis ca. 6μ latis $5-14\mu$ longis laevibus; cellulis marginalibus exterioribus quadratis, interioribus elongatis in basi intramarginaliter decurrentibus.

Venezuela. Territoria Federal Amazonas: Cerro Yapacana, alrededores del campamento a lo largo del río en las faldas en la parte suroeste, Lat. $3^{\circ} 45' N$, Long. $66^{\circ} 45' W$. altura: 825 metros, 4 May 1970, J.A.Steyermark 103154 (US, holotype; VEN, isotype).

The new species of Syrrhopodon is of that group with very reduced cancellinae and mostly brownish to reddish leaf bases. The species is most obviously distinctive in the thickened margins which are continued for a distance intramarginally at the lower end.

In the same series of collections from the Guayana Highland region there is a specimen of perhaps the most closely related species, Syrrhopodon rupestris Mitt. (Territorio Amazonas, a lo largo de río Yatua, Cerro Araucaua, on bluffs at base of igneous outcrop, 11-12 April 1970, J. A. Steyermark 102544). The specimen has been compared with a portion of the type material (Brazil, Spruce 14) and agrees in all respects including habitat. The new specimen is apparently only the second known collection of the species and the first from within the boundaries of Venezuela. Both the foregoing species appear quite distinct from the more widely distributed S. rigidus Hook. & Grev. which has much shorter leaves and shorter stems with less distinct leaf bases.



Figs. 1-6. Venezuelan mosses. 1-3. *Cheilothela vaginata*. 1. Leaves. 2. Leaf cross-sections. 3. Upper marginal cells of leaf. 4-6. *Syrrhopodon steyermarkii*. 4. Leaves. 5. Upper leaf cells. 6. Leaf margin at top of sheathing base.

STUDIES IN THE EUPATORIEAE (ASTERACEAE). LXXI.

A NEW GENUS, HATSCHBACHIELLA.

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Attempts to complete the reorganization of the Eupatorieae of Southern Brazil have revealed a natural group of two species with unenlarged hirsute style bases. For this group we establish a new genus, Hatschbachiella.

The genus is notable for the small narrow leaves with nearly entire margins and for the corymbose inflorescences with subimbricate obtuse phyllaries. The appearance is similar to the related genus Austroeupatorium and one of the species has been frequently confused with a species of the latter genus. Through the kindness of Mr. Charles Jeffrey of the Royal Botanic Gardens, Kew, the type specimen of Eupatorium tweedianum has been seen and it proves to have the setiferous achene and short but distinct small-celled carpopodium which we recognize as characters of Hatschbachiella. We have previously placed the species in Austroeupatorium on the basis of misidentified specimens of the superficially similar Eupatorium laetevirens Hook. & Arn. which has only glands on the achene and has an elongate carpopodium of very large cells.

A second genus of close relationship to Hatschbachiella is Stomatanthus which also has setiferous achenes and shorter small-celled carpopodia. Stomatanthus differs from Hatschbachiella in general aspect by the usually pyramidally to thyrsoid-paniculate inflorescences and differs in detail by the unusually short stout and straight filaments of the anthers.

The new genus is named for Dr. Gerdt Hatschbach of the Museu Botânico Municipal, Curitiba, Brazil. Dr. Hatschbach has been an active collector of the Southern Brazil flora.

Hatschbachiella R.M.King & H.Robinson, genus novum Asteracearum (Eupatorieae). Plantae herbaceae erectae paucae ramosae. Caules teretes. Folia opposita vel alterna subsessilia vel brevipetiolata, laminis anguste ellipticis integris vel remote serrulatis. Inflorescentiae corymbosae paniculatae.

Involucris squamae subimbricatae 12-15 bi-triseriate hirsutae et glanduliferae obtusae; receptacula plana glabra. Flores 10-12 in capitulo; corollae anguste infundibulares 5-lobatae extus glanduliferae intus glabrae, cellulis angustis parietibus sinuosis, lobis aequilateraliter triangularibus sublaevibus; filamenta antherarum in parte inferiore longa, in parte superiore angusta, cellulis quadratis vel elongatis, parietibus annulate ornatis, cellulis exothecialibus subquadratis, appendicibus antherarum late ovatis; styli inferne non incrassati hirsuti, appendicibus linearibus vel anguste clavatis distincte papillosis; achaenia prismatica 5-costata setifera et glandulifera; carpopodia valde distincta brevia, cellulis subquadratis non inflatis, parietibus subnodulosis; pappus setiformis uniseriatus, setis 30-40 scabris ad apicem tenuibus, cellulis apicalibus acutis.

Species typica: Eupatorium tweedieanum Hook. & Arn.

Our studies of the genus indicate that it contains the following two species.

Hatschbachiella polyclada (Dusen ex Malme) R.M.King & H.Robinson, comb. nov. Eupatorium polycladum Dusen ex Malme in Svensk. Vet.-Akad. Handl. Ser.. III. xii. No. 2, 39. 1933. Brazil.

Hatschbachiella tweedieana (Hook. & Arn.) R.M.King & H.Robinson, comb. nov. Eupatorium tweedieanum Hook. & Arn. in Hook. Comp. Bot. Mag. 1: 242. 1835 (1836). Argentina, Brazil, Paraguay, and Uruguay.

Acknowledgement

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STUDIES IN THE EUPATORIEAE (ASTERACEAE). LXXII.

NOTES ON THE GENUS KOANOPHYLLON.

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In the months since the circumscription of the genus Koanophyllon (King & Robinson, 1971) three points have arisen that warrant publication. These include a neotypification of the type species, a new species and further notes on one of the common central american species.

Richard Howard of Harvard University has rightly called our attention to the problem of neotypification of the type species of the genus Koanophyllon. From all indications there is no existing specimen of K. tinctoria of Arruda de Camara and the nature of the original work suggests that no herbarium specimen was ever prepared. In view of this fact we take the opportunity to select a neotype that will properly affirm the identity of the species with the later described and widely used name Eupatorium laeve DC. Among the specimens cited by de Candolle (1836) under the original description of E. laeve and recorded on the microfiche series of the de Candolle herbarium in Geneva is a collection by Lhostky from Rio de Janeiro, Brazil. We propose that this specimen be recognized as the neotype of Koanophyllon tinctoria and as the lectotype of Eupatorium laeve DC.

Though the genus Koanophyllon ranges from the Southwestern United States south to Argentina, the center of distribution seems to be unquestionably Guatemala and the adjacent areas. It is from a closely adjacent region in the Maya Mountains of the interior of British Honduras that the following new species has been collected.

Koanophyllon sorensenii R.M.King & H.Robinson, sp. nov.

Suffrutex 0.5 m altus. Caules et petioli minute dense fulvo-tomentosi. Folia opposita petiolata, petiolis ad 1 cm longis; lamina usque ad 10.5 cm longa 3.5 cm lata ovato-elliptica, basi acuta, margine remote crenulata, apice vix acuminata, paginis utrinque puncto-glanduliferis, inferioribus minute albo-tomentosis; nervatura pinnata; inflorescentia laxa paniculata; capitula ca 8 mm alta;

involucris squamae bi-triseriatae ca. 15 acutae exteriores extus minute dense fulvo-tomentose; flores ca. 10; corolla tubularis, lobis longe triangularibus extus glanduliferis; appendices antherarum breves profunde fisses; styli ad apicem vix clavati; achaenia pauca setifera et glandulifera; pappi setae tenues ca. 30, Grana pollinis ca. 20 μ diam. breviter spinosa.

British Honduras: along "Pine Ridge" of Chiquibul Rd. near junction of Little Vaqueros Creek, zone of pine and melastomaceous scrub, scattered oaks present also. 19 August 1971. Low shrub, 0.5 m tall, rays absent, style branches pale greenish yellow. Paul D. Sorenson 7129 (Holotype US!).

The new species has the general habit of Koanophyllon solidaginoides, K. celtidifolia and K. hondurensis but lacks the ternervate condition at the base of the leaf. The corolla lobes and style branches also differ by being narrower than usual for the genus

A special effort has been made to further analyse the rather distinctive Central American species Koanophyllon albicaulis (Schultz-Bip. ex Klatt) R.M.King & H.Robinson. A number of interesting comments have been obtained by reviewing comments on various labels. The plant ranging from western Mexico to Honduras is common in moist thickets and is known by at least two common names in British Honduras "Water wood" and "Sholte schnook (Mayan) (Old woman's walking stick)". Of more significance is a comment on a Honduras collection (Standley 53173) "Used to color green cord, cloth etc." It would seem that K. albicaulis like K. tinctoris is a dye plant. There remains a possibility the dye chemical is different though related since the comment indicates a green dye while the Brazilian dye is referred to as indigo. Perhaps chemical taxonomists will be induced to study the problem in more detail.

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STUDIES IN THE EUPATORIEAE (ASTERACEAE). LXXIII.

THE GENUS, OPHRYOSPORUS.

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The genus Ophryosporus is a large and natural group of Eupatorieae occurring mostly in the Central and Southern Andes of South America. The group is consistent in the reduced form of the anther appendage and has been long recognized as a distinct genus. The clavate form of the style branches and uniform structure of most flower parts has also helped others to recognize the genus. It is necessary here to make only slight revisions.

The genus is extended here to include one additional species previously placed in a separate monotypic genus, Trychinolepis B.L. Robinson from southern Peru. The scale-like pappus caused B.L. Robinson to establish the separate genus though the relationship to Ophryosporus was recognized. The knowledge of unreliability of the pappus and the fact that it is the only difference leads to the present reduction of the genus.

The type species of Ophryosporus along with other Chilean species present a rather distinctive appearance with small shorter petioled leaves and more spikelike inflorescences. The type species even has hairs on the inside of the corolla in some specimens, but there is not enough basis in our estimation for a distinct genus or subgenus.

Three Mexican species of Decachaeta were placed at one time in Ophryosporus by B.L. Robinson because of their short anther appendages. These species can be distinguished from Ophryosporus easily by the alternate rather than opposite leaves, the larger number of flowers per head, the distinct tuft of hairs on the receptacle, the anther appendage being reflexed and undivided instead of inflexed and divided, and by the cells of the anther collar lacking annular thickenings. No species of Ophryosporus is presently recognized north of Colombia.

Ophryosporus Meyen, Reise 1: 1834-35.

Trychinolepis B. L. Robinson, Contr. Gray Herb.
n.s. 80: 6. 1928.

Woody herbs to subshrubs, sparingly branched often with prominent axillary fascicles. Leaves opposite, petioles ca. 1 mm. long or up to 1 cm. long, blades minute or large and broadly lanceolate to elliptical, usually cuneate at base, margins coarsely to scarcely serrate. Inflorescence corymbose, a thyrse or panicle with corymbose branches. Involucre of 4-8 imbricate, subequal phyllaries, in 1-2 series, receptacle slightly convex, glabrous, 3-12 flowers per head; corollas constricted below, tubular to funnel-form above, 5-lobed, lobes with short slightly to distinctly projecting cells; stomates absent; anther collar with short cells below and distinct annular thickenings on the walls. Anther appendage very small, double intumed remnant, filaments short or rather long, inserted well above base; style base without enlarged node, glabrous. Style branch expanded at tip, smooth and thickened, narrower and mamillate below. Achenes prismatic 5-ribbed, with small headed glands or setae or both; base of achene usually twisted with wedge shaped groups of cells prominent. Carpogonium distinct, slightly to strongly tapered, with small quadrate rather thin-walled cells. Pappus of bristles or broad lacinate scales.

Type species: Ophryosporus triangularis Meyen

Our studies indicate that the genus contains the following 29 species.

Ophryosporus angustifolius B.L.Robinson, Contr. Gray Herb. n.s. 90:3. 1930. Bolivia.

Ophryosporus apricus B.L.Robinson, Contr. Gray Herb. n.s. 73: 3. 1924. Peru.

Ophryosporus axilliflorus (Griseb.) Hieron., Engl. Bot. Jahrb. 22: 706. 1897. Argentina, Bolivia.

Ophryosporus bipinnatifidus B.L.Robinson, Proc. Amer. Acad. 55: 5. 1919. Peru.

Ophryosporus charua (Griseb.) Hieron., Engl. Bot. Jahrb. 22: 705. 1897. Argentina.

Ophryosporus chilca (H.B.K.) Hieron., Engl. Bot. Jahrb. 22: 706. 1897. Peru.

Ophryosporus clavulatus Griseb., Goett. ABH. 24: 173. 1879. Argentina.

Ophryosporus cumingii (Sch.-Bip.) Benth., Benth. & Hook. f. Gen. 2: 188. 1873. Bolivia.

Ophryosporus eleutherantherus (Rusby) B.L.Robinson, Contr. Gray Herb. 61: 27. 1920. Bolivia, Peru.

Ophryosporus freyreysia (Dallm.) Baker, Mart. Fl. Bras. 6(2): 188. 1876. Brazil.

Ophryosporus hoppii (B.L.Robinson) R.M.King & H. Robinson, comb. nov. Trychinolepis hoppii B.L. Robinson, Contr. Gray Herb. n.s. 80: 6. 1928. Peru.

Ophryosporus johnstonii B.L.Robinson, Contr. Gray Herb. 77: 4. 1926. Chile.

Ophryosporus kuntzei Hieron., Engl. Bot. Jahrb. 22: 707. 1897. Bolivia.

Ophryosporus laxiflorus Baker, Mart. Fl. Bras. 6(2): 189. 1876. Brazil.

Ophryosporus lorentzii Hieron., Engl. Bot. Jahrb. 22: 706. 1897. Argentina.

Ophryosporus macbridei B.L.Robinson, Contr. Gray Herb. n.s. 73: 4. 1924. Peru.

Ophryosporus macrodon Griseb., Goett. ABH. 24: 173. 1879. Argentina, Bolivia.

Ophryosporus organensis Cabr., Arq. Jard. Bot. Rio Janeiro, 15: 74, tab. 6. 1957. Brazil.

Ophryosporus origanoides (Meyen & Walp.) Hieron., Engl. Bot. Jahrb. 22: 707. 1897. Bolivia, Ecuador, Peru.

Ophryosporus ovatus B.L.Robinson, Proc. Amer. Acad. 55: 5. 1919. Peru.

Ophryosporus pachychaeta Baker, Mart. Fl. Bras. 6(2): 187. 1876. Brazil.

Ophryosporus paradoxus (Hook. & Arn.) Benth., Benth.
& Hook. f. Gen. 2: 239. 1873. Chile.

Ophryosporus piquerioides (A.P.Decandolle) Benth.,
Benth. & Hook. f. Gen. 2: 239. 1873. Argentina,
Bolivia, Chile, Peru.

Ophryosporus regnellii Baker, Mart. Fl. Bras. 6(2):
188. 1876. Brazil.

Ophryosporus saltensis Hieron., Engl. Bot. Jahrb.
22: 705. 1897. Argentina.

Ophryosporus serratifolius (H.B.K.) B.L.Robinson,
Contr. Gray Herb. n.s. 90: 3. 1930. Colombia.

Ophryosporus sodiroi Hieron., Engl. Bot. Jahrb. 29:
3. 1930. Ecuador.

Ophryosporus steinbachii B.L.Robinson, Contr. Gray
Herb. n.s. 77: 5. 1926. Bolivia.

Ophryosporus triangularis Meyen, Reise 1: 402. 1834.
Chile.

Ophryosporus venosissimus (Rusby) B.L.Robinson, Proc.
Amer. Acad. 41: 271. 1905. Bolivia.

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A NEW SPECIES OF MYROCARPUS (LEGUMINOSAE)
AND A BRIEF RESUME OF THE GENUS

Velva E. Rudd, Smithsonian Institution

The small genus Myrocarpus Freire Allemão has hitherto been known only from southern Brazil, Paraguay, and northeastern Argentina. The new species from Venezuela, described below, is an interesting disjunct.

Like the related genera, Myroxylon L. f. and Myrospermum Jacq., it is balsamiferous, and when sterile can be recognized by leaflets with pellucid dots and dashes. Myrocarpus has smaller flowers, the pods are elongate, compressed, usually 3-5-seeded, with marginal wings, in contrast to those of Myroxylon and Myrospermum which are commonly 1-seeded, with a basal wing.

Some of the species of Myrocarpus are poorly known, and I am reserving judgment as to how "good" they are. The following key and descriptions are based on what information I have at hand.

Myrocarpus, with Myroxylon and Myrospermum, has been placed in the faboid tribe Sophoreae by most authors. Hutchinson (Gen. Fl. Pl. 1: 314. 1964) included Myrocarpus in his expanded interpretation of the tribe Cadiæ, which he transferred from the Caesalpinaceae to the Fabaceae, but retained Myroxylon and Myrospermum in the Sophoreae. Much more study is needed of the genera transitional between the caesalpinoid and faboid Leguminosae before a satisfactory understanding and classification can be reached. For the time being, I prefer to retain Myrocarpus in the Sophoreae sensu latior.

MYROCARPUS Freire Allemão, Diss. Leg. 26 Oct. 1847.

Trees, unarmed, balsamiferous; leaves alternate, imparipinnate, (1-)3-9 (-10)-foliolate; leaflets alternate, ovate to lanceolate-ovate, glabrous, with pellucid dots and dashes; stipules minute, caducous; stipels lacking; inflorescences axillary or pseudoterminal, many-flowered spicate racemes; bracts minute, deltoid; bracteoles lacking; flowers small, fragrant, about 6-8 mm. long; calyx turbinate-campanulate, subsericeous 3-4 mm. long with 5 short, subequal lobes, the vexillar lobes sometimes connate; corolla with (3-4) 5 free, whitish, linear, clawed, subequal, glabrous petals about 1 mm. wide; stamens 6, 8, or 10, the filaments free, subequal, mostly exceeding the petals, the anthers uniform, subcordiform, basifixed, dehiscing by lateral slits; ovary brevi-stipitate, usually 3-5-ovulate, the style short, glabrous, the stigma minute, terminal; fruit elongate, laterally compressed, samaroid with marginal wings, commonly 3-5 seeded; seeds compressed fusiform or oblong, the hilum apical.

Type species: M. fastigiata Freire Allemão.

Key to species

- Leaflets 1.5-2.7 cm. long, 1-1.5 cm. wide, acute to obtuse;
fruit 7-8 mm. wide, the wings about 2 mm. wide, the seminiferous body 3.5-4 mm. wide; ovary lightly pubescent, glabrescent; flowers Dec.-Jan. Brazil: Rio de Janeiro.
1. M. fastigiata.
- Leaflets (2-) 2.5-9 cm. long, 1.5-6 cm. wide, acute to acuminate, occasionally obtuse or emarginate; fruit 10-20 mm. wide, the wings 3-6 mm. wide, the seminiferous body 3-9 mm. wide; ovary glabrous.
- Fruit with body 8-9 mm. wide; leaves 3-4-foliolate, the axis 1.5-4 cm. long; flowers Sept. Brazil: eastern São Paulo.
3. M. leprosus.
- Fruit with body 3-6 mm. wide; leaves (1-) 4-9-foliolate, the axis (3-) 5-12 cm. long.
- Length of fruit 4.5-9 cm. long, the width 1-2 cm. the body about 3 mm. wide, the wings 3-6 mm. wide; flowers May-Dec. Brazil: southern Minas Gerais and Rio de Janeiro south to Santa Catarina; Paraguay; northeastern Argentina.
2. M. frondosus.
- Length of fruit 9-19 cm. long, the width 2 cm., the body 5-6 mm. wide, the wings 5-8 mm. wide; flowers Jan.? (fruit in April). Venezuela: western Apure.
4. M. venezuelensis.

1. MYROCARPUS FASTIGIATUS Freire Allemão, Diss. Leg. 26 Oct. 1847.
Type: F. Freire Allemão s.n., Brazil, Rio de Janeiro, "silvis primaevae" (holotype R ?; isotypes BM, G, F neg. 28193 ex G).

Large tree; leaves 5-9 (-10)-foliolate, the axis about 3.5-6.5 cm. long; leaflets ovate to elliptic, 1.5-2.7 cm. long, 1-1.5 cm. wide, acute to obtuse, occasionally emarginate, the base rounded to acute; flowers (in January and February) about 6 mm. long, the calyx 2-3 mm. long; stamens 6, 8, or 10 (fide Freire Allemão); ovary pubescent, glabrescent; fruit about 2.5-6 cm. long, 7-8 mm. wide, the seminiferous body 3.5-4 mm. wide, the wings 2 mm. wide.

Distribution: Known only from the area of the type collection.

Local names: cabureiba; oleo pardo.

2. MYROCARPUS FRONDOSUS Freire Allemão, Diss. Leg. 22 Sept. 1848.
Type: F. Freire Allemão s.n., Brazil, Rio de Janeiro, "silvis primaevae" (holotype R ?; isotypes BM, G, F neg. 28194 ex G).
- Leptolobium ? punctatum Benth., Linnaea 22: 526. Sept. 1849.
Type: A. F. Regnell II-65¹, Brazil, Minas Gerais, Caldas, 26 Aug. 1868 (in flower) (holotype K; isotypes NY, US).
- Myrocarpus paraguariensis Hallier f. Meded. Rijks. Herb. Leiden no. 27: 40. 1915. Type: K. Fiebrig 165 (as 105), Paraguay, Cordillera de Altos, 29 Sept. 1902 (holotype L; isotypes P, US).
- Myrocarpus frondosus forma paraguariensis (Hallier f.) Hassler, Repert. Nov. Spec. Fedde 16: 233. 1919.

Tree, to about 25 m. tall; leaves (1-3) 5-10-foliolate, the axis (3-)5-12 cm. long; leaflets ovate to lanceolate-ovate, (2-) 2.5-7 cm. long, 1.5-3.5 cm. wide, acute to acuminate, sometimes obtuse or emarginate, the base rounded to acute; flowers (in May-December) about 6-8 mm. long, the calyx 3-4 mm. long; stamens 10; ovary glabrous; fruit 4.5-9 cm. long, 1-2 cm. wide, the body about 3 mm. wide, the wings 3-6 mm. wide.

Distribution: In forest, southern Brazil, Paraguay, and northeastern Argentina, at elevations of 100-1200 m.

Local names: cabreuna; cabreúva; ibirá-payo; ivirá-paye; incienso; oleo pardo.

Specimens examined:

BRAZIL: Minas Gerais: Caldas, Regnell II-65¹, 16 Sept. 1865 (US). Rio de Janeiro: Novo Friburgo, Glaziou 11908 (NY, P, US). Petropolis, Glaziou 8446 (NY, US), 11906 (P, US), 11907 (P). Guanabara: Corcovado, Glaziou 6516 (P, US). Tijuca, Glaziou 6837 Tingua, Glaziou 8649 (P). Rio de Janeiro, Horto Florestal, Herb. no. 111914 (NY). São Paulo: Areias, Kuhlmann 4422 (NY, US). Cabreúva, Hoehne 31001 (NY). Souza, Moreira de Souza s. n. (NY). Paraná: Paranaguá, Hatschbach 2480 (US). Campina Grande do Sul, Hatschbach 5212 (US), 17812 (US). Morrêtes, Hatschbach 22125 (NY). Santa Catarina: Bom Retiro, Lomba Alta, Smith, Reitz, & Klein 7957 (NY, US). Herval Velho, above Rio Leão, Smith & Reitz 12417 (US). Xanxerê, Smith & Reitz 12496 (NY, US). Itapiranga, Rio Uruguai, Smith & Reitz 12660 (NY, US). São Miguel d'Oeste, Smith & Reitz 12809 (US). Uruguai, Vila Rica, by Rio do Peixe, Smith & Reitz 12924 (US). Rafael, Ibirama, Klein 678 (US). Ibirama, Reitz & Klein 3835 (NY, US). Serra do Matador, Rio do Sul, Reitz & Klein 7246 (NY, US), 8291 (US). Alto Matador, Rio do Sul, Reitz & Klein 7588 (NY, US). Rio do Meio, Lauro Mueller, Reitz & Klein 8228 (NY, US). Sanga da Areia, Jacinto Machado, Reitz & Klein 9290 (NY), 9369 (US).

PARAGUAY: Montes del Parque, Rojas 8649a (US). Villarrica, Jørgensen 3605 in part (US). Limpio, Hassler 3226 (NY, P). Río Paraguay near Concepción, Hassler 7335 (NY, P, US). Yparacay, Hassler 12228 (L, NY, US), 12682 (L, NY, US). Yaguarón, Balansa 3112 (L, P, US).

3. MYROCARPUS LEPROSUS Pickel, Arq. Bot. Estad. S. Paulo, n. ser. 3: 161, tab. 41. 1955. Type: B. J. Pickel s. n., Brazil, São Paulo, Santos, "in fragosis montis S. Theresiae," 29 Sept. 1949 (flowers), 27 Nov. 1949 (immature fruit) (holotype SPSF no. 3462; isotype SP no 53474).

Small trees; leaves 3-4-foliolate, the axis 1.5-3.5 (-4) cm. long; leaflets ovate to obovate, 5-9 cm. long, 3-4.5 cm. wide, acuminate, obtuse, or retuse, the base acute or rounded; flowers (in September) about 8 mm. long, the calyx 4 mm. long; stamens 8-10; ovary glabrous; fruit (immature) 5 cm. long, 1.7 cm. wide, the seminiferous body 8-9 mm. wide, the wings 3-4 mm. wide.

Distribution: Known only from the type collections.

I have not seen material of M. leprosus. The above description is based on that of Pickel. The species seems to be very close to M. frondosus, differing chiefly in the size of the fruit.

4. MYROCARPUS VENEZUELENSIS Rudd, sp. nov.

Type: J. A. Steyermark, G. Bunting, & C. Blanco 101748, Venezuela, Apure, Reserva Forestal San Camilo, "selva siempreverde a lo largo de la Quebrada de la Cristalina hasta la vega del Cerro La Nulita," 250-280 m. alt., 2 April 1968 (holotype US no. 2622434; isotypes NY, VEN).

Arbor, M. frondosus affinis, sed imprimis fructibus majusculis differt.

Tree about 25 m. tall; leaves 5-7-foliolate, the axis 6-12 cm. long; leaflets ovate, 4-8 cm. long, (2-) 2.5-4 cm. wide, acuminate, the base rounded to subcordate; complete flowers not seen, calyx 3-4 mm. long; fruit 9-19 cm. long, 2 cm. wide, the seminiferous body 5-6 mm. wide, the wings 5-6 mm. wide.

Distribution: Known only from the type collection.

Local name: barbasco.

STUDIES IN THE EUPATORIEAE (ASTERACEAE). LXXIV.

NEW SPECIES OF CRITONIA, FLEISCHMANNIA AND HEBECLINIUM.

R. M. King and H. Robinson
Smithsonian Institution, Washington, D.C. 20560.

The revised classification of the Eupatorieae has greatly simplified the identification of specimens and has facilitated the recognition of previously undescribed species. Four new species, belonging to the following three genera, are described here.

Critonia dominicensis R.M.King & H.Robinson, sp. nov. Frutices ca. 2 m alti laxi ramosi. Caules teretes vel obscure angulati glabri. Folia opposita longe petiolata, petiolis 1.5-2.0 mm longis; lamina anguste lanceolata 12-20 cm longa 3-5 cm lata glabra distincte punctata longe attenuata remote serrulata base anguste cuneata, nervis pinnatis secundariis utrinque 6-7. Inflorescentiae dense corymbosae; pedicelli glabri. Capitula 3-6 fasciculata ca. 6 mm alta; flores 5; involucri squamae ca. 20, imbricatae 4-5-seriatae valde inaequilongae interiores anguste oblongae facile deciduae glabrae; corollae anguste tubulares ca. 3.5 mm longae glabrae, lobis longe triangularibus; appendices antherarum vix longiores quam latae; appendices stylarum lineares; achaenia temeriter setifera, late costata, basi angustata; pappi setae ca. 35 ad apicem leniter dilatatae. Grana pollinis ca. 20 μ diam.

Type: DOMINICA: British West Indies: Fond Baron Estate. Abundant shrubs ca. 2 m. tall, shade, flowers all past anthesis. 18 December 1967. Robert Merrill King 6301. (Holotype US !).

The species is in the group with Critonia dalea but the long attenuate leaf apex is very distinctive. The following species should also be added to the genus Critonia though the anther appendage is somewhat shorter.

Critonia platychaeta (Urban) R.M.King & H.Robinson, comb. nov. Eupatorium platychaetum Urban, Notizbl. Bot. Gart. Berlin 8: 23. 1921. Jamaica.

Fleischmannia cuatrecasasii R.M.King & H.Robinson, sp. nov. Plantae herbaceae vel suffrutescentes erectae usque ad 3 dm altae, pauce vel multo ramosae in sicco olivaceae vel atratiores. Caules teretes puberuli. Folia opposita vix petiolata, petiolis 1-2 mm longis; lamina linearis elliptica usque ad 2.7 cm longa, 0.3 cm lata, remote pauce serrulata ad apicem anguste obtusa base anguste cuneata trinervata, supra subglabra, subtus in nervis et marginem minute puberula. Inflorescentiae laxae cymosae; pedicelli puberuli 2-5 mm longi. Capitula 3.5 mm alta; flores ca. 20; involucri squamae 20-25 subimbricatae tri-seriatae inaequilongae interiores ca. 2.5 mm longae, anguste oblongae, breviter acutae vel oblongae, base distincte callosae; corollae anguste infundibulares 1.5-1.7 mm longae, extus inferne glabrae, lobis equilateraliter triangularibus extus saepe pauce breviter setiferis; thecae antherarum 0.5-0.7 mm longae; appendices parvae vix longiores quam latae superne crenulatae; achaenia glabra vel perpauce setifera; carpopodia valde tumescentia latiora quam longa; pappi setae ca. 25. Grana pollinis 18-20 μ diam.

Type: COLOMBIA: Valle del Cauca: Quebrada La Brea, near Cordoba. Flowers pink. November 7, 1944. Earl L. Core 1549 (Holotype US!). Paratypes El Valle: Rio Calima: Quebrada de La Brea. Alt. 30-40 m. May 1946 Richard Evans Schultes & Mardoqueo Villarreal 7359 (US!). Valle: Rio Calima (region del Choco): entre Pailon y El Coco. 50 met. alt. 23 Mayo 1946. J. Cuatrecasas 21245 (Facultad de Agronomia del Valle ?).

The species is related to F. misera of the Choco but is distinct by the more erect habit, narrower more remotely serrulate margins, darker color and firmer texture of the leaves. According to Dr. Cuatrecasas the species occurs in a distinctive ecological niche in the region largely lacking composites in the pacific lowlands of Colombia, a zone inland from the outer coastal zone where the Eupatorian genus Tubero-styles is found.

Hebeclinium reedii R.M.King & H.Robinson, sp. nov. Suffrutices erecti. Caules teretes dense longe hirsuti. Folia opposita longe petiolata, petiolis 3-4 cm longis; lamina late ovata usque ad 12 cm longa, 8 cm lata, distincte breviter acuminata duplo-serrata basi late cuneata supra in nervis breviter hirsutis,

subtus in nervis et nervulis hirsutis, nervis pinna-tis secundariis utrinque ca. 4-5, ca. 45° ascendentibus. Inflorescentiae laxae cymosae; pedicelli breviter hirsuti. Capitula plerumque 3-fasciculata, ca. 6 mm alta; flores 20-25 albi; involucri squamae ca. 40 imbricatae quadriseriatae valde inaequilongae anguste oblongae obtusae superne puberulae; receptacula convexa ubique sclerotica pilosa; corolla anguste infundibulares ca. 3 mm longa intus glabra, lobis breviter triangularibus extus dense setiferis, setis brevibus; appendices antherarum vix longiores quam latae; achaenia glabra; pappi setae ca. 25 ad apicem distincte breviter dilatatae. Grana pollinis 18-20 μ diam.

Type: PANAMA: Darien: Cerro Pirre. Matita, flores blancas, sin olor. 11 de Abril 1967. Narciso Bristan 464. (Holotype US!).

The species is apparently closest to Hebeclinium phoenicticum of adjacent Colombia but leaves of the latter are more nearly entire or slightly crenulate with undersurface more densely pubescent. The petioles of the latter species are generally shorter and thicker and the phyllaries are narrower at the tips and more sparsely pubescent.

We take great pleasure in naming this new species for Dr. Clyde F. Reed of Baltimore, Maryland who very generously donated the type specimen to the United States National Herbarium.

Hebeclinium costaricense R.M.King & H.Robinson, sp. nov. Hebeclinio reedii simile sed caulibus minus pubescentibus, foliis minus acuminatis, laminis 9-16 cm longis 6-9 cm latis margine leniter crenulatis, subtus in nervulis hirtellis, receptaculis magis convexis, floribus ca. 40 in capitulo, achaeniis pauca glanduliferis.

Type: Costa Rica:Alajuela. Near La Laguna, 6 to 8 km. south of Villa Quesada. Alt. 1200 m. Feb. 19, 1966. Flowers white, herb 1.5 meters tall. Cut over forest area, mountains. Antonio Molina R., Louis O. Williams, William C. Burger & Bruce Wallenta 17545. (F !). Paratype Costa Rica. Cataratas de San Ramon.. February 28, 1931. A.M. Brenes 13564 (F !).

The new species is clearly distinct from either of the two species of Hebeclinium previously known

from Costa Rica. From H. macrophyllum, the new species differs most obviously by the broadly cuneate rather than cordate leaf-base and by the broader tipped less glaucous phyllaries. Hebeclinium hygrophyaemum (B.L. Robinson) R.M.King & H.Robinson has longer elliptical leaves with nearly entire margins. The new species is actually most closely related to H. reedii described above from eastern Panama. The panamanian species is most easily distinguished by the closely doubly serrate leaf margin but differs more significantly in the less convex receptacle bearing fewer flowers and by the glabrous achene.

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STUDIES IN THE EUPATORIEAE (ASTERACEAE). LXXV.

A NEW GENUS, CRONQUISTIANTHUS.

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One of the most important elements of the Eupatorieae in the Andean Region is a complex of rather woody species with nearly smooth corolla lobes, plain styles, and well-developed anther appendages. Many of the species have distinctive pale pubescence on the underside of their leaves. One genus related to the complex, Lourteigia, has been described previously (King & H. Robinson, 1971) having achenes greatly constricted under the pappus, having 20 or ca. 40 flowers per head and having dense clusters of hairs on the outer surface of the corolla lobes. A second genus of the complex, Cronquistianthus, is described here on the basis of 13 species that lack the constriction under the pappus, have 8-18 flowers per head and have only glands or scattered hairs on the outer surface of the corolla lobes. A marked characteristic of the new genus is the usually stopper-shaped asymmetrical carpopodium set off by numerous thin-walled easily collapsing wedge-shaped cells. None of the other related genera have such distinctly delimited carpopodia.

There are some other features of the new genus that are notable. The glands on the corolla are more like those of Ophryosporus and Helogyne in lacking much enlarged apical cells. The enlarged tips of the style branches of some species are also reminiscent of Ophryosporus. Ophryosporus is totally distinct by the small anther appendages and Helogyne differs by its densely glanduliferous achenes and very broad style branches. The involucre of some species of Cronquistianthus, especially C. chamaedriifolius, have strongly imbricated phyllaries and resemble those of Chromolaena. The latter genus has a totally different type of carpopodium with straight sides and an outer sheath of cells while the typical element has papillose corolla lobes and a distinctive form of anther collar. One species of Cronquistianthus, C. organoides, has scattered hairs inside of the corolla, a feature not found in any other species of the genus, even the closely related C. niveus. A feature that does seem consistent throughout

Cronquistianthus is the form of the pappus setae which taper to a narrow rather smooth tip.

In naming the new genus we honor again Dr. Arthur Cronquist of the New York Botanical Garden whose philosophical guidance and objectivity have been particularly welcome to the authors.

Cronquistianthus R.M.King & H.Robinson, genus novum Asteracearum (Eupatorieae). Plantae frutescentes erectae pauci- vel multi-ramosae. Caules teretes, glabrescentes; ramulis puberulis. Folia opposita breviter vel longe petiolata, laminis linearibus, lanceolatis vel ovatis acutis utrinque pubescentibus subtus interdum dense albotomentosis, margine integris vel serratis. Inflorescentiae dense corymbosae, capitulis subsessilibus saepe in glomerulis congestis. Involucris squamae imbricatae valde inaequilongae tri-quinquieseriatae, 12-25, obtusae; receptacula plana glabra. Flores 8-18 in capitulo; corollae tubulares vel anguste infundibulares 5-lobatae, lobis aequilateraliter triangularibus vel longioribus laevibus extus glanduliferis vel breviter setiferis, glandibus vix capitatis; filamenta antherarum alte inserta, in parte superiore angusta, cellulis quadratis vel elongatis, parietibus transverse annulatis, cellulis exothecialibus subquadratis, appendicibus longioribus quam latis interdum retusis; styli inferne non nodulosi glabri, appendicibus breviter papillosis ad apicem linearibus vel abrupte dilatatis; achaenia prismatica plerumque 5-costata pauca vel multo setifera; carpodia distincta subobturaculiformia valde inaequalia, cellulis parvis subquadratis vel rotundatis multi-seriatis, parietibus aliquantum incrassatis; pappus setiformis uniseriatus, setis ca. 30-35 contiguas ad apicem sensim angustioribus, cellulis apicalibus acutis.

Species typica: Eupatorium niveum H. B. K.

Our studies of the genus indicate that it contains the following 13 species.

Cronquistianthus chamaedrifolius (H.B.K.) R.M.King & H.Robinson, comb. nov. Eupatorium chamaedrifolium H.B.K., Nov. Gen. et Sp. 4: 88-89. ed. fol. 1818. Ecuador, Peru.

Cronquistianthus chotensis (Hieron.) R.M.King & H. Robinson, comb. nov. Eupatorium chotense Hieron. Engl. Bot. Jahrb. 36: 466. 1905. Peru.

Cronquistianthus desmophyllus (B.L.Robinson) R.M.King
& H.Robinson, comb.nov. Eupatorium desmophyllum
B.L.Robinson, Contr. Gray Herb. n.s. 73: 9. 1924.
Peru.

Cronquistianthus glomeratus (A.P.Decandolle) R.M.King
& H.Robinson, comb. nov. Eupatorium glomeratum
A.P.Decandolle, Prodr. 5: 154. 1836. Peru.

Cronquistianthus kalenbornianus (B.L.Robinson) R.M.
King & H.Robinson, comb. nov. Eupatorium
kalenbornianum B.L.Robinson, Contr. Gray Herb.
n.s. 61: 8. 1920. Peru.

Cronquistianthus lavandulaefolius (A.P.Decandolle)
R.M.King & H.Robinson, comb. nov. Eupatorium
lavandulaefolium A.P.Decandolle, Prodr. 5: 154.
1836. Peru.

Cronquistianthus leucophyllus (H.B.K.) R.M.King & H.
Robinson, comb. nov. Eupatorium leucophyllum
H.B.K., Nov. Gen. et Sp. 4: 90. ed. fol. 1818.
Peru.

Cronquistianthus niveus (H.B.K.) R.M.King & H. Robins.
comb. nov. Eupatorium niveum H.B.K., Nov. Gen.
et Sp. 4: 90. ed. fol. 1818. Colombia, Ecuador.

Cronquistianthus organoides (H.B.K.) R.M.King & H.
Robinson, comb. nov. Eupatorium organoides
H.B.K., Nov. Gen. et Sp. 4: 89. ed. fol. 1818.
Colombia, Ecuador.

Cronquistianthus pseudorganoides (Hieron.) R.M.King
& H.Robinson, comb. nov. Eupatorium pseud-
organoides Hieron., Engl. Bot. Jahrb. 29: 10.
1900. Ecuador.

Cronquistianthus rugosus (H.B.K.) R.M.King & H.Robin-
son, comb. nov. Eupatorium rugosum H.B.K., Nov.
Gen. et Sp. 4: 89. ed. fol. 1818. Colombia,
Ecuador.

Cronquistianthus urubambensis (B.L.Robinson) R.M.King
& H.Robinson, comb. nov. Eupatorium urubambense
B.L.Robinson, Contr. Gray Herb. n.s. 60: 58.
1919. Peru.

Cronquistianthus volkensis (Hieron.) R.M.King & H.
Robinson, comb. nov. Eupatorium volkensis Hieron.,

Engl. Bot. Jahrb. 40: 370. 1908. Peru.

Reference

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Acknowledgement

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A FIFTH SUMMARY OF THE VERBENACEAE, AVICENNIACEAE, STILBACEAE,
DICRASTYLIDACEAE, SYMPHOREMACEAE, NYCTANTHACEAE, AND
ERIOCAULACEAE OF THE WORLD AS TO VALID TAXA, GEOGRAPHIC
DISTRIBUTION, AND SYNONYMY

Supplement 1

Harold N. Moldenke

Addenda & errata to Part I:

The name, "Phyla nodiflora var. reptans (H.B.K.) Moldenke", is to be corrected to read "Phyla nodiflora var. reptans (Spreng.) Moldenke" in the 58 places where the name occurs.

UNITED STATES OF AMERICA:

Maine:

Eriocaulon pellucidum Michx. [Isle au Haut]

Verbena hastata L. [Isle au Haut]

Massachusetts:

Eriocaulon parkeri B. L. Robinson [Barnstable County]

Connecticut:

Verbena simplex Lehm. [Middlesex County]

New Jersey:

Eriocaulon pellucidum Michx. [Cape May County]

Verbena simplex Lehm. [Cape May County]

Verbena stricta Vent. [Cape May County]

North Carolina:

Clerodendrum trichotomum var. ferrugineum Nakai [Surry County]

Verbena hastata L. [Ashe County]

Verbena urticifolia L. [Ashe County]

South Carolina:

Lantana horrida H.B.K. [Orangeburg County]

Phyla lanceolata (Michx.) Greene [Georgetown County]

Verbena brasiliensis Vell. [McCormick County]

Verbena urticifolia L. [Georgetown County]

Florida:

Clerodendrum bungei Steud. [Dade County]

Duranta repens var. alba (Masters) L. H. Bailey [Monroe County]

Lippia alba (Mill.) N. E. Br. [Monroe County]

Vitex agnus-castus L. [Dade County]

Vitex glabrata R. Br. [Dade County]

Mississippi:

Clerodendrum bungei Steud. [Claiborne County]

Ohio:

Verbena bracteata Lag. & Rodr. [Gallia County]

Indiana:

Verbena bipinnatifida Nutt. [Lake County]
Verbena canadensis (L.) Britton [Franklin County]
Verbena simplex Lehm. [Franklin County]
Verbena stricta Vent. [Franklin County]

Minnesota:

Verbena bracteata Lag. & Rodr. [Houston County]
Verbena hastata L. [Houston County]
Verbena hastata f. rosea Cheney

South Dakota:

Verbena hastata L. [Jones Island]

Missouri:

Verbena brasiliensis Vell. [Saint Louis]

Louisiana:

Phyla incisa Small [Saint Bernard Parish]

Oklahoma:

Verbena bipinnatifida Nutt. [Roger Mills County]

Texas:

Verbena plicata Greene [Armstrong County]
Vitex negundo var. intermedia (P'ei) Moldenke [Donley County]

Oregon:

Verbena officinalis var. albiflora Strobl [Multnomah County]

MEXICO:

Bouchea nelsonii Grenz. [Veracruz]
Bouchea spathulata var. longiflora Moldenke [Coahuila]*
Callicarpa acuminata var. argutedentata Moldenke [Chiapas & Tamaulipas]
Callicarpa acuminata var. pringlei (Briq.) Moldenke [Hidalgo, Quintana Roo, San Luis Potosí, Tamaulipas, Veracruz, & Yucatán]
Callicarpa pringlei Briq. -- to be deleted
Citharexylum affine D. Don [Veracruz]
Citharexylum oleinum (Benth.) Moldenke [Oaxaca]
Cornutia pyramidata var. isthmica Moldenke [Yucatán]
Eriocaulon molinae L. O. Williams [Jalisco]
Lantana velutina f. macrophylla Moldenke [Guerrero & Oaxaca]*
Lantana velutina f. violacea Moldenke [Oaxaca]
Lippia hypoleia var. ovatifolia Moldenke -- delete the asterisk
Lippia mcvaughii Moldenke [Jalisco]
Lippia pringlei f. intecta Moldenke [Jalisco]
Phyla incisa Small [Hidalgo]
Verbena elegans var. asperata Perry [Veracruz]
Vitex agnus-castus L. [Nuevo León]

YUCATAN ISLANDS:

Callicarpa acuminata var. pringlei (Briq.) Moldenke [Cozumel]
Callicarpa pringlei Briq. -- to be deleted

GUATEMALA:

Bouchea prismatica var. brevirostra Grenz. [El Petén]

- Callicarpa acuminata H.B.K. [Guatemala]
Callicarpa acuminata var. argutedentata Moldenke [El Petén]
Citharexylum cooperi Standl. [Izabal]
Citharexylum crassifolium Greenm. [Chimaltenango & Santa Rosa]
Citharexylum donnell-smithii Greenm. [San Marcos & Zacapa]
Citharexylum hirtellum Standl. [Izabal]
Citharexylum mocinni D. Don [El Quiché, Guatemala, Quezaltenango, & Sacatepéquez]
Citharexylum pterocladum Donn. Sm. [Chimaltenango & El Petén]
Citharexylum steyermarkii Moldenke [Zacapa]
Cormutia grandifolia (Schlecht. & Cham.) Schau. [Guatemala & Sacatepéquez]
Cormutia pyramidata var. isthmica f. albida Moldenke [El Petén]*
Duranta guatemalensis Moldenke [Huehuetenango]
Lantana hirta Grah. [El Quiché]
Lantana hispida H.B.K. [Chiquimula]
Lantana microcephala A. Rich. [El Petén]
Lantana trifolia L. [El Quiché & Guatemala]
Lippia alba (Mill.) N. E. Br. [Alta Verapaz & Chiquimula]
Lippia cardiostegia Benth. [Alta Verapaz, Chimaltenango, El Quiché, & Sacatepéquez]
Lippia chiapasensis Loes. [Baja Verapaz, Sololá, & Totonicapán]
Lippia curtisiana Moldenke -- delete Baja Verapaz, Sololá, & Totonicapán
Lippia hypoleia var. ovatifolia Moldenke [El Progreso]
Lippia substrigosa Turcz. [Alta Verapaz & Chiquimula]
Petrea volubilis L. [Chimaltenango, El Progreso, El Quiché, Escuintla, Jutiapa, & San Marcos]
Phyla nodiflora (L.) Greene [Chiquimula]
Phyla scaberrima (A. L. Juss.) Moldenke [Alta Verapaz, Retalhuleu, Sacatepéquez, & Sololá]
Phyla stoechadifolia (L.) Small [Alta Verapaz & Jutiapa]
Priva aspera H.B.K. [El Quiché, Escuintla, & Jalapa]
Priva mexicana (L.) Pers. [Escuintla, Jalapa, & Progreso]
Stachytarpheta jamaicensis (L.) Vahl [Jutiapa]
Verbena litoralis H.B.K. [Baja Verapaz, Chimaltenango, El Quiché, Jalapa, Retalhuleu, & Sacatepéquez]
Verbena teucrifolia Mart. & Gal. [Guatemala, Huehuetenango, San Marcos, Sololá, & Totonicapán]
Vitex kuylenii Standl. [Alta Verapaz]

BRITISH HONDURAS:

- Citharexylum crassifolium Greenm.
Citharexylum hirtellum Standl.

HONDURAS:

- Aegiphila laxi cupulis Moldenke

Aegiphila panamensis Moldenke
Bouchea nelsonii Grenz.
Callicarpa acuminata var. argutidentata Moldenke
Eriocaulon molinae L. O. Williams -- delete the asterisk
Lantana achyranthifolia Desf.
Lantana glandulosissima Hayek [Atlántida]
Lippia cardiostegia Benth. [Intibucá]
Phyla scaberrima (A. L. Juss.) Moldenke [Morazán]
Priva mexicana (L.) Pers.
Stachytarpheta angustifolia (Mill.) Vahl
Vitex gaumeri Greerm. [Atlántida]

GULF OF HONDURAS ISLANDS:

Avicennia germinans (L.) L. [Soldier Cay]
Lantana involucrata var. odorata (L.) Moldenke [Caulker & Long Cays]

NICARAGUA:

Aegiphila deppeana Steud.
Ghinia spicata (Aubl.) Moldenke
Stachytarpheta jamaicensis (L.) Vahl [Matagalpa]
Vitex kuylenii Standl.

PANAMA:

Aegiphila costaricensis Moldenke

BAHAMA ISLANDS:

Avicennia germinans (L.) L. [Cat]

CUBA:

Callicarpa resinosa Wright & Moldenke -- delete "Pinar del Río"

JAMAICA:

Lantana angustifolia x L. camara Adams*
Lantana angustifolia x L. trifolia Adams*
Lantana camara x L. insularis Adams*
Lantana involucrata x L. reticulata Adams*

VIRGIN ISLANDS:

Lantana involucrata f. rubella Moldenke [Anegada]

LEEWARD ISLANDS:

Duranta repens L. [Montserrat]
Holmskioldia sanguinea Retz. [Dominica]
Petrea kohautiana Presl [Marie Galante]
Vitex divaricata Sw. [Marie Galante]

NORTHERN SOUTH AMERICAN ISLANDS:

Lantana armata Schau. [Margarita]
Lantana involucrata L. [Orchila & Punta Brava]
Stachytarpheta coccinea Schau. -- to be deleted

COLOMBIAN CARIBBEAN ISLANDS:

Duranta coriacea Hayek [San Andres]
Lantana armata Schau. [San Andres]
Lantana maxima Hayek [San Andres]
Lippia alba (Mill.) N. E. Br. [San Andres]

COLOMBIA:

Aegiphila elata Sw. [Arauca]Eriocaulon spruceanum f. viviparum Moldenke — delete the asteriskPaepalanthus andicola var. villosus Moldenke — delete the asteriskStachytarpheta cayennensis f. albiflora Moldenke [Antioquia]Stachytarpheta elatior Schrad. [Vichada]

VENEZUELA:

Aegiphila glandulifera Moldenke [Táchira]Aegiphila odontophylla Donn. Sm. [Mérida]Clerodendrum speciosissimum Van Geert [Mérida]Duranta coriacea Hayek — to be deletedDuranta mutisii f. serrulata Moldenke [Aragua]Duranta steyermarkii Moldenke [Mérida]Gmelina arborea Roxb. [Barinas]Holmskioldia sanguinea Retz. [Mérida]Lantana armata Schau. [Guárico, Mérida, & Trujillo]Lantana armata var. velutina Moldenke [Mérida, Táchira, & Trujillo]Lantana boyacana Moldenke [Aragua]Lantana camara L. [Barinas & Mérida]Lantana cujabensis Schau. [Barinas & Mérida]Lantana fiebrigii Hayek [Mérida]Lantana glutinosa Poepp. [Barinas]Lantana maxima Hayek [Barinas]Lantana trifolia f. hirsuta Moldenke [Mérida]Lippia alba (Mill.) N. E. Br. [Mérida]Lippia hirsuta L. f. — to be deletedLippia micromera Schau. [Mérida]Paepalanthus andicola var. villosus Moldenke [Táchira]Stachytarpheta elatior var. jermani Moldenke [Cojedes]Syngonanthus huberi Ruhl. [Bolívar]Tectona grandis L. f. [Trujillo]xVerbena hybrida Voss [Mérida]Verbena parvula Hayek [Mérida]Verbena tenera Spreng. [Mérida]

FRENCH GUIANA:

Stachytarpheta urticaefolia (Salisb.) Sims

ECUADOR:

Duranta mutisii f. serrulata Moldenke [Loja]

PERU:

Aegiphila cordata Poepp. [Huánuco]Aegiphila haughtii Moldenke [San Martín]Aegiphila spicata (Rusby) Moldenke [Huánuco & Loreto]Avicennia germinans (L.) L. [Pancho Island]Citharexylum flexuosum var. glaberrimum Moldenke [Ancash]*

Lantana zahlbruckneri Hayek [Ancash]
Verbena bonariensis L. [Arequipa & Lima]
Verbena cuneifolia Ruiz & Pav. [San Martín]
Verbena parvula Hayek [Loreto]
Vitex cymosa Bert. [Tumbes]
Vitex gigantea H.B.K. [Tumbes]
Vitex schunkei Moldenke [Loreto]*

BRAZIL:

Aegiphila chrysantha Hayek [Pará]
Aegiphila gloriosa var. paraënsis Moldenke [Pará]*
Aegiphila microcalycina Moldenke [Roraima]*
Amasonia lasiocaulos Mart. & Schau. [Acre]
Citharexylum reitzii Moldenke — to be deleted
Eriocaulon dictyophyllum f. viviparum Moldenke [Mato Grosso]*
Eriocaulon kunthii Körn. — to be deleted
Eriocaulon spruceanum f. viviparum Moldenke [Mato Grosso]*
Lantana camara var. angustifolia Moldenke [Mato Grosso]
Lantana cujabensis Schau. [Acre]
Lantana micrantha Briq. [Mato Grosso]
Lantana trifolia L. [Acre]
Leiosthrix hirsuta f. vivipara Moldenke [Guanabara]*
Lippia sidoides Cham. [Maranhão]
Paepalanthus dichotomus var. brasilensis Moldenke [Minas Gerais]*
Paepalanthus fulgidus var. zuloagensis Moldenke [Amazônas]*
Paepalanthus planifolius (Bong.) Körn. [Rondônia]
Paepalanthus rhizocephalus Alv. Silv. [Mato Grosso]
Petrea rivularis Moldenke [Amazônas]
Stachytarpheta angustifolia (Mill.) Vahl [Pará]
Stachytarpheta gesnerioides var. cuneata Schau. [Distrito Federal]
Stachytarpheta goyazensis Turcz. [Distrito Federal]
Stachytarpheta simplex Hayek [São Paulo]
Syngonanthus densifolius Alv. Silv. [Goiás]
Syngonanthus helminthorrhizus (Mart.) Ruhl. [Distrito Federal]
Syngonanthus humboldtii var. glandulosus Gleason [Amazônas]
Verbenoxylum reitzii (Moldenke) Troncoso [Santa Catarina]*
Vitex panchiniana Moldenke [Mato Grosso]
Vitex triflora var. hirsuta Moldenke [Acre]*

BOLIVIA:

Aegiphila spicata (Rusby) Moldenke — delete the asterisk
Lantana chamissonis (D. Dietr.) Benth. [Tarija]
Verbena cabreræ Moldenke [Tarija]

PARAGUAY:

Verbena guaranitica (Troncoso) Moldenke

CHILE:

Junellia tridactylites (Lag.) Moldenke [Curicó]

ARGENTINA:

- Aloysia meyeri Moldenke [Jujuy]
Lantana grisebachii Stuck. [Jujuy]
Lantana hassleri Briq. [Corrientes]
Lantana minasensis var. hispida Moldenke [Corrientes]*
Verbena aristigera S. Moore [Corrientes]
Verbena glutinosa Kuntze [La Pampa]
Verbena guaranitica (Troncoso) Moldenke [Corrientes & Misiones]
Verbena litoralis var. caracasana (H.B.K.) Briq. [Tucumán]
Verbena megapotamica Spreng. [Corrientes & Entre Ríos]
Verbena ovata Cham. [Corrientes]
Verbena parodii (Covas & Schnack) Moldenke [La Pampa]
Verbena perakii (Covas & Schnack) Moldenke [Catamarca & Córdoba]
Verbena pulchra Moldenke [Corrientes]
Verbena radicata var. glabra (Hicken) Moldenke [Mendoza]* —
this is the corrected entry
Verbena tristachya Troncoso & Burkart [Lechiguanas Island]

MACARONESIA:

- Lantana camara var. aculeata (L.) Moldenke [Gomera & Palma]
Phyla nodiflora (L.) Greene [Gomera & Gran Canaria]
Verbena bonariensis L. [Gomera]
Verbena supina L. [Fuertaventura, Lanzarote, & Tenerife]

ITALY:

- Verbena bracteata Lag. & Rodr.
Vitex agnus-castus var. laciniosa Ces.*

SICILY:

- Verbena supina f. erecta Moldenke
Vitex agnus-castus f. alba (West.) Rehd.

PANTELLERIA:

- Verbena officinalis L.

MALTA:

- Verbena officinalis L.

COMINO ISLAND:

- Vitex agnus-castus L.

GOZO ISLAND:

- Verbena officinalis L.
Vitex agnus-castus L.

ALGERIA:

- Phyla nodiflora var. canescens (H.B.K.) Moldenke

TUNISIA:

- Phyla nodiflora var. canescens (H.B.K.) Moldenke
Vitex agnus-castus L.

CYRENAICA:

- Verbena officinalis L.
Vitex agnus-castus L.

MALI:

- Avicennia africana P. Beauv. [Senegambia]

Lippia abyssinica (Otto & Dietr.) Cuf. [Soudan]

SUDAN:

Clerodendrum cordifolium (Hochst.) R. Br. [Dafur]

ERITREA:

Clerodendrum discolor (Klotzsch) Vatke

ETHIOPIA:

Eriocaulon richardi Körn. — to be deleted

REPUBLIC OF SOMALI:

Clerodendrum hildebrandtii Vatke

Lantana viburnoides var. velutina Moldenke

Lippia somalensis Vatke -- delete the asterisk

Vitex tangensis Gürke

SÉNÉGAL:

Lippia multiflora Moldenke

REPUBLIC OF GUINEA:

Lippia abyssinica (Otto & Dietr.) Cuf.

SIERRA LEONE:

Premna quadrifolia Schum. & Thonn.

Vitex chrysocarpa Planch.

Vitex ferruginea Schum. & Thonn.

IVORY COAST:

Vitex simplicifolia Oliv.

GHANA:

Lantana rugosa Thunb.

Lippia abyssinica (Otto & Dietr.) Cuf.

TOGOLAND:

Lippia abyssinica (Otto & Dietr.) Cuf.

NIGERIA:

Clerodendrum capitatum var. conglobatum (J. G. Baker) Thomas

Lantana rugosa Thunb. [Northern & Southern]

ZAIRE:

Premna quadrifolia Schum. & Thonn.

RWANDA:

Clerodendrum discolor (Klotzsch) Vatke

UGANDA:

Clerodendrum discolor var. oppositifolium Thomas

Clerodendrum myricoides var. camporum Gürke

Clerodendrum schweinfurthii var. bakeri (Gürke) Thomas

CHOLE ISLAND:

Clerodendrum glabrum E. Mey.

KENYA:

Clerodendrum buchholzii Gürke

Clerodendrum capitatum (Willd.) Schum. & Thonn.

Clerodendrum cordifolium (Hochst.) R. Br.

Clerodendrum discolor var. oppositifolium Thomas

Clerodendrum fischeri Gürke

Clerodendrum makanjamum Winkler

Clerodendrum scheffleri Gürke
Clerodendrum triplinerve Rolfe
Clerodendrum umbellatum Poir.
Lantana rhodesiensis Moldenke
Lippia grandifolia Hochst.
Lippia somalensis Vatke
Premna angolensis Gürke
Vitex negundo L.

ANGOLA:

Clerodendrum polycepalum J. G. Baker [Kongo]

ZAMBIA:

Clerodendrum capitatum var. conglobatum (J. G. Baker) Thomas

RHODESIA:

Clerodendrum capitatum (Willd.) Schum. & Thonn.
Kalaharia uncinata f. rubra Moldenke

MALAWI:

Clerodendrum discolor var. dümmeri Thomas
Kalaharia uncinata f. rubra Moldenke

NAMIBIA:

Clerodendrum discolor var. crenatum Thomas
Kalaharia uncinata f. rubra Moldenke

SWAZILAND:

Clerodendrum triphyllum (Harv.) H. H. W. Pearson

LESOTHO:

Clerodendrum triphyllum (Harv.) H. H. W. Pearson
Eriocaulon abyssinicum Hochst.
Eriocaulon bauri N. E. Br.
Eriocaulon dregei Hochst.
Verbena officinalis L.

SOUTH AFRICA:

Clerodendrum discolor var. crenatum Thomas [Transvaal]
Clerodendrum ternatum var. lanceolatum (Gürke) Moldenke [Bechuanaland]
Eriocaulon abyssinicum Hochst. [Cape Province, Natal, & Transvaal]
Eriocaulon sonderianum Körn. [Natal]
Lantana rugosa Thunb. [Cape Province]
Verbena rigida Spreng. [Orange Free State]

COMORO ISLANDS:

Avicennia marina (Forsk.) Vierh. [Euphrates]
Clerodendrum leucophloeum Balf. f.
Premna obtusifolia R. Br. [South]
Stachytarpheta jamaicensis (L.) Vahl [West]

IRAN:

Eriocaulon cinereum R. Br.
Vitex negundo L.

AFGHANISTAN:

Vitex negundo L.

PAKISTAN:

Caryopteris odorata var. integrifolia Moldenke [Northwestern Provinces]

Caryopteris paniculata C. B. Clarke [Poonch]

Gmelina arborea Roxb. [Northwestern Provinces]

Verbena officinalis L. [Karachi]

BANGLADESH:

Clerodendrum urticifolium (Roxb.) Wall.

NEPAL:

Caryopteris paniculata C. B. Clarke

Eriocaulon exsertum Satake*

Eriocaulon kathmanduense Satake*

Eriocaulon obclavatum Satake*

Eriocaulon trisectoides Satake*

BHUTAN:

Caryopteris odorata (Hamilt.) B. L. Robinson

Clerodendrum kaempferi (Jacq.) Sieb.

INDIA:

Aloysia triphylla (L'Hér.) Britton [Madras]

Avicennia marina (Forsk.) Vierh. [New & West Islands]

Avicennia marina var. acutissima Stapf & Moldenke [Saurashtra]

Avicennia officinalis L. [Sagar Island]

Caryopteris grata Benth. [Kashmir]

Caryopteris odorata (Hamilt.) B. L. Robinson [Madhya Pradesh]

Caryopteris odorata var. integrifolia Moldenke [East Punjab & Uttar Pradesh]

Caryopteris paniculata C. B. Clarke [Uttar Pradesh]

Clerodendrum inerme (L.) Gaertn. [Rajasthan; Manauli & New Islands]

Clerodendrum kaempferi (Jacq.) Sieb. [Khasi States]

Clerodendrum macrostachyum Turcz. [Khasi States]

Clerodendrum paniculatum L. [Kerala]

Clerodendrum philippinum var. simplex Moldenke [Mysore]

Clerodendrum phlomidis L. f. [Saurashtra]

Clerodendrum urticifolium (Roxb.) Wall. [Assam]

Clerodendrum venosum Wall. [Khasi States]

Eriocaulon collinum Hook. [Kerala]

Eriocaulon leucomelas Steud. [Andhra Pradesh]

Eriocaulon luzulaefolium Mart. [Andhra Pradesh]

Eriocaulon nilagirensis Steud. [Kerala]

Eriocaulon polycephalum Hook. f. — delete the asterisk

Eriocaulon robustum Steud. — delete the asterisk

Eriocaulon setaceum L. [Bihar]

Eriocaulon thwaitesii Körn. [Mysore]

Phyla nodiflora (L.) Greene [Sagar Island]

Premna barbata Wall. [Kashmir]

Premna latifolia var. viburnoides (Wall.) C. B. Clarke [Manauli]

Island]

Premna obtusifolia R. Br. [Hare Island]

Sphenodesme ferruginea (W. Griff.) Briq. [Assam]

Sphenodesme pentandra var. wallichiana (Schau.) Munir [Khasi States]

Stachytarpheta urticaefolia (Salisb.) Sims [Kerala]

Tectona grandis L. f. [Kerala]

Verbena officinalis L. [Bihar]

Vitex altissima f. alata (Willd.) Moldenke [Madras & Mysore]

Vitex pinnata L. [Gujarat]

CHAGOS ARCHIPELAGO:

Phyla nodiflora (L.) Greene [Diego Garcia]

Premna obtusifolia R. Br. [Diego Garcia]

Stachytarpheta jamaicensis (L.) Vahl [Diego Garcia]

CEYLON:

Lantana camara L.

BURMA:

Clerodendrum indicum f. semiserratum (Wall.) Moldenke [Upper Burma]*

Clerodendrum macrostachyum Turcz. [Tenasserim]

Clerodendrum nutans Jack [Upper Burma]

Clerodendrum semiserratum Wall. -- to be deleted

Clerodendrum serratum (L.) Moon [Tenasserim]

Congea griffithiana Munir [Upper Burma]

Glossocarya mollis Wall. [Tenasserim]

Gmelina arborea var. glaucescens C. B. Clarke [Tenasserim & Upper Burma]

Holmskioldia sanguinea Retz. [Upper Burma]

Vitex axillaris Wall. -- to be deleted

Vitex limonifolia Wall. [Tenasserim]

Vitex peduncularis Wall. [Tenasserim]

Vitex scabra Wall. [Upper Burma]

NICOBAR ISLANDS:

Gmelina elliptica J. E. Sm.

Vitex negundo L.

MERGUI ARCHIPELAGO:

Clerodendrum paniculatum L. [Mergui]

Congea griffithiana Munir [Mergui]

Congea velutina Wight [Mergui & Tavoy]

Congea vestita W. Griff. [Mergui]

Sphenodesme ferruginea (W. Griff.) Briq. [Mergui & Tavoy]

Sphenodesme griffithiana Wight [Mergui & Tavoy]

Vitex axillaris Wall. [Tavoy]*

CHINA:

Caryopteris incana (Thunb.) Miq. [Kwangsi]

Caryopteris incana var. nana (Dreer) Moldenke [Chekiang, Kiangsi, & Kwangtung]

Caryopteris incana var. szechuanensis Moldenke [Szechuan]*

Caryopteris mongholica Bunge [Kansu]

Caryopteris terniflora Maxim. [Szechuan]

CHINESE COASTAL ISLANDS:

Caryopteris incana var. nana (Dreer) Moldenke [Honam]

THAILAND:

Callicarpa brevipetiolata Merr.

Clerodendrum godefroyi Kuntze

Clerodendrum schmidtii var. macrophyllum Moldenke*

Congea connata Fletcher -- delete the asterisk

Eriocaulon polycephalum Hook. f.

Eriocaulon robustum Steud.

KOH CHANG ISLAND:

Congea connata Fletcher

INDOCHINA:

Clerodendrum godefroyi Kuntze -- delete the asterisk

Eriocaulon cinereum R. Br. [North Vietnam]

Eriocaulon sexangulare L. [North Vietnam]

Sphenodesme involucrata var. paniculata (C. B. Clarke) Munir
[Cochinchina]

MALAYA:

Clerodendrum deflexum Wall. [Singapore]

Clerodendrum paniculatum L. [Malacca]

Gmelina elliptica J. E. Sm. [Penang & Singapore]

Peronema canescens Jack [Penang]

JAPAN:

Caryopteris incana f. macrophylla Moldenke*

Eriocaulon decemflorum f. aberans Satake*

RYUKYU ISLAND ARCHIPELAGO:

Vitex trifolia var. subtrisecta (Kuntze) Moldenke [Ishigaki]

FORMOSA:

Caryopteris incana var. nana (Dreer) Moldenke

PHILIPPINE ISLANDS:

Clerodendrum bethunianum Lowe [Samar]

Clerodendrum cumingianum Schau. [Luzon]

Clerodendrum curranii Elm. [Culi6n & Paragua]

Clerodendrum inerme (L.) Gaertn. [Palmas]

Clerodendrum intermedium Cham. [Basilan & Masbate]

Clerodendrum kaempferi (Jacq.) Sieb. [Luzon; delete "Negros"]

Clerodendrum klemmei var. puberulum Moldenke [Luzon]*

Clerodendrum minahassae var. brevitubulosum H. J. Lam [Biliran,
Mindoro, & Samar]

Clerodendrum minahassae var. grandicalyx Moldenke [Leyte]*

Clerodendrum philippinum var. simplex Moldenke [Samar]

Clerodendrum trichotomum Thunb. [Sabtan]

Clerodendrum umbellatum var. speciosum (Dombrain) Moldenke [Lu-
zon]

Holmskioldia sanguinea Retz. [Luzon]

BONIN ISLANDS:

Callicarpa glabra Koidz. [Chichijima]

GREATER SUNDA ISLANDS:

Avicennia marina f. angustata Moldenke [Sarawak]*

Avicennia officinalis L. [Sarawak]

Premna canescens Hansford [Java]*

WALLIS & FUTUNA ISLANDS:

Clerodendrum inerme (L.) Gaertn. [Futuna]

Stachytarpheta urticaefolia (Salisb.) Sims [Futuna & Wallis]

Vitex trifolia var. bicolor (Willd.) Moldenke [Futuna]

LOYALTY ISLANDS:

Vitex trifolia var. bicolor (Willd.) Moldenke [Urea]

NEW CALEDONIAN ISLANDS:

Gmelina ligum-vitreum Guillaum. [New Caledonia]*

Holmskioldia sanguinea Retz. [New Caledonia]

FIJI ISLANDS:

Faradaya neo-ebudica var. puberulenta (Moldenke) Moldenke [Tavulevu]

AUSTRALIA:

Eriocaulon australe R. Br. [South Australia]

Eriocaulon cinereum R. Br. [South Australia]

Eriocaulon nanum R. Br. [South Australia]

Eriocaulon mutans F. Muell. [Northern Territory]*

Eriocaulon pallidum R. Br. [South Australia]

Eriocaulon stillulatum Hook. [Northern Territory]*

CULTIVATED:

Aloysia triphylla (L'Hér.) Britton [South Africa]

Bouchea fluminensis (Vell.) Moldenke [England]

Callicarpa dichotoma (Lour.) K. Koch [Russia]

Callicarpa japonica Thunb. [Russia]

Callicarpa japonica f. albibacca Hara [New Jersey]

xCaryopteris clandonensis Simmonds [Canada]

Caryopteris grata Benth. [Burma]

Caryopteris incana var. nana (Dreer) Moldenke — delete the asterisk

Clerodendrum aculeatum (L.) Schlecht. [Florida]

Clerodendrum glabrum E. Mey. [England]

Clerodendrum japonicum (Thunb.) Sweet [England]

Clerodendrum petasites (Lour.) S. Moore [Scotland]

Clerodendrum philippinum Schau. [Spain]

Clerodendrum philippinum var. simplex Moldenke [England]

Clerodendrum speciosissimum Van Geert [Philippines & Scotland]

Clerodendrum thomsonae Balf. f. [Scotland]

Clerodendrum thomsonae var. delectum L. H. Bailey [England]

Clerodendrum thomsonae var. variegatum L. H. Bailey [England]

Clerodendrum tomentosum (Vent.) R. Br. [England]

- Clerodendrum trichotomum Thunb. [Canada & Russia]
Clerodendrum ugandense Prain [Jamaica]
Clerodendrum umbellatum var. speciosum (Dombrain) Moldenke
 [England]
Congea tomentosa Roxb. [Martinique]
Duranta repens L. [Ghana]
Gmelina arborea Roxb. [Ghana & Venezuela]
Holmskioldia sanguinea Retz. [Burma, China, Colombia, Guatemala,
 la, Haiti, & Nepal]
Lantana camara L. [Russia]
Lantana camara var. alba Moldenke [Venezuela]
Lantana camara var. flava (Medic.) Moldenke [Venezuela]
Lantana camara var. mista (L.) L. H. Bailey [New Jersey & Ven-
 ezuela]
Lantana camara var. mutabilis (Hook.) L. H. Bailey [Venezuela]
Lantana involucrata L. [Venezuela]
Lantana montevidensis (Spreng.) Briq. [Venezuela]
Lippia alba (Mill.) N. E. Br. [Jamaica]
Petrea arborea H.B.K. [England]
Petrea arborea var. broadwayi Moldenke [England]
Petrea kohautiana Presl [England]
Petrea kohautiana var. alba (Freeman & Williams) Moldenke [Eng-
 land]
Petrea volubilis var. albiflora (Standl.) Moldenke [England]
Phyla nodiflora var. canescens (H.B.K.) Moldenke [Algeria &
 Tunisia]
Premna esculenta Roxb. [England]
Premna latifolia Roxb. [England]
Premna obtusifolia R. Br. [England]
Tectona grandis L. f. [England & Ghana]
Teucrium parvifolium Hook. f. [New Zealand]
Verbena ambrosifolia Rydb. [Texas]
Verbena bipinnatifida Nutt. [Texas]
Verbena bracteata Lag. & Rodr. [Spain]
Verbena crithmifolia Gill. & Hook. [Argentina]
Verbena flava Gill. & Hook. [Argentina]
Verbena glutinosa Kuntze [Argentina]
Verbena hookeriana (Covas & Schnack) Moldenke [Argentina]
xVerbena hybrida Voss [Armenia, Australia, Belgium, Egypt,
 Lithuania, Luxemburg, Malaysia, Maryland, Portugal, Rho-
 desia, Romania, South Africa, & Tasmania]
Verbena microphylla H.B.K. [Argentina]
Verbena origenes R. A. Phil. [Argentina]
Verbena parodii (Covas & Schnack) Moldenke [Argentina]
Verbena perakii (Covas & Schnack) Moldenke [Argentina]
Verbena peruviana (L.) Britton [Hungary, Peru, Spain, & Tortola]
Verbena peruviana (L.) Britton x V. elegans H.B.K. [Massachusetts]

- Verbena peruviana (L.) Britton x V. moricolor Moldenke [Massachusetts]*
- Verbena peruviana (L.) Britton x V. pulchella Sweet [Massachusetts]*
- Verbena phlogiflora Cham. [Formosa]
- Verbena platensis Spreng. [Guatemala]
- Verbena radicata Moldenke [Argentina]
- Verbena rigida Spreng. [Jamaica]
- Verbena santiaguensis (Covas & Schnack) Moldenke x V. peruviana (L.) Britton [Argentina]*
- Verbena santiaguensis (Covas & Schnack) Moldenke x V. phlogiflora Cham. [Argentina]*
- Verbena santiaguensis (Covas & Schnack) Moldenke x V. pulchella Sweet [Massachusetts]*
- xVerbena teasii Moldenke [India]
- Verbena tenera Spreng. [Spain]
- Verbena temuisecta Briq. [Guatemala & Honduras]
- xVerbena wingei Moldenke [India]
- xVeronicena haartmani Moldenke — to be deleted
- Vitex agnus-castus L. [Canada, England, Jamaica, Luxemburg, Mexico, Russia, & South Africa]
- Vitex agnus-castus f. alba (West.) Rehd. [England]
- Vitex negundo L. [Kenya & Russia]
- Vitex negundo var. heterophylla (Franch.) Rehd. [Canada]
- Vitex trifolia L. [England]

Addenda & errata to Part II:

- Aegiphila chotzkiana Cham. = A. lhotzkiana Cham.
- Aegiphila hoffmannioides Standl. & Steyerl. = ?Hoffmannia lenticellata Hemsl., Rubiaceae
- Aegiphila integrifolia (Jacq.) Jacq. = A. integrifolia (Jacq.) Jacks.
- Aegiphila knotzkiana Cham. = A. lhotzkiana Cham.
- Aegiphila umbellata Vell. = Feramea corymbosa Aubl., Rubiaceae — this is the corrected entry
- Aegiphyla pendula Moldenke = Aegiphila pendula Moldenke
- Agmus castus Cast. = Vitex agnus-castus L.
- Aloysia gracillissima Mears = A. gratissima (Gill. & Hook.) Troncoso
- Aloysia gratissima (Gill.) Troncoso = A. gratissima (Gill. & Hook.) Troncoso
- Aloysia hatschbachii Moldenke = A. hatschbachii Moldenke
- Aloysia reichei Moldenke = A. reichii Moldenke
- Avicennia officinalis Kurz = A. alba Blume
- Avicennia officinalis sec. auct. afr. = A. marina (Forsk.) Vierh.
- Callicarpa americana Sessé & Moc. = C. acuminata var. pringlei (Briq.) Moldenke — this is the corrected entry

Callicarpa bodinieri var. lyu (Léveillé) Rehd. = C. bodinieri var. lyi (Léveillé) Rehd.

Callicarpa ereoclona Hansford = C. erioclona Schau.

Callicarpa formosensis Hansford = C. formosana Rolfe

Callicarpa japonica 'Leucocarpa' McGourty = C. japonica f. albi-bacca Hara

Callicarpa oreoclona Hansford = C. erioclona Schau.

Callicarpa pringlei Briq. = C. acuminata var. pringlei (Briq.)

Moldenke -- this is the corrected entry

Callicarpa pringlei Briq. = C. acuminata var. pringlei (Briq.)
Moldenke

Callicarpa pringlei Briq. = C. acuminata var. pringlei (Briq.)

Moldenke -- this is the corrected entry

Callicarpa vestita Wall. ex C. B. Clarke = C. vestita Wall.

Callicarpa n. 9 Hook. f. & Thoms. = Caryopteris paniculata C. B. Clarke

Caryopteris incanus Miq. = C. incana (Thunb.) Miq.

Caryopteris mastacanthus var. clandonensi Barbey = xC. clandonensis Simmonds

Caryopteris mongolica Maxim. = C. mongolica Bunge

Caryopteris nepetaefolia Maxim. = C. nepetaefolia (Benth.) Maxim.

Caryopteris odorata (Roxb.) B. L. Robinson = C. odorata (Hamilt.) B. L. Robinson

Caryopteris serratum (L.) Moon = Clerodendrum serratum (L.) Moon

Cellicarpa Hansford = Callicarpa L.

Cellicarpa magna Hansford = Callicarpa arborea var. psilocalyx (H. J. Lam) Moldenke

Citahrexyllum Mold. = Citharexylum B. Juss.

Citahrexyllum reitzii Mold. = Verbenoxylum reitzii (Moldenke) Troncoso

Citharexylum cordatum Stevens = C. caudatum L.

Citharexylum fruticosum L. = C. fruticosum L.

Citharexylum hintonii Moldenke = C. hintoni Moldenke

Citharexylum mocinnii var. longibracteolatum Moldenke = C. mocinnii var. longibracteolatum Moldenke

Citharexylum reitzii Moldenke = Verbenoxylum reitzii (Moldenke) Troncoso

Clandularia J. F. Gmel. = Verbena [Dorst.] L.

Clandularia caroliniensis J. F. Gmel. = Verbena canadensis (L.) Britton

Clerodendrin Westcott = Clerodendrum Burm.

Clerodendrin thomsonae Westcott = Clerodendrum thomsonae Balf. f.

Clerodendron bethuneanum Law. = Clerodendrum bethunianum Lowe

Clerodendron bethunianum Lour. = Clerodendrum bethunianum Lowe

Clerodendron blancoi Merr. = Clerodendrum minahassae var. brevitubulosum H. J. Lam

Clerodendron buchanani Roxb. = Clerodendrum buchanani (Roxb.) Walp.

- Clerodendron bungeana Ledin = Clerodendrum bungei Steud.
Clerodendron castaneaefolium Klotzsch = Clerodendrum viscosum
 Vent.
Clerodendron commersonii (Lam.) Spreng. = Clerodendrum inerme (L.)
 Gaertn.
Clerodendron discolor Klotzsch = Clerodendrum discolor (Klotzsch)
 Vatke
Clerodendron formicarium Hansford = Clerodendrum triplinerve Rolfe
Clerodendron glabrum angustifolia Sims = Clerodendrum glabrum E.
 Mey.
Clerodendron glandulosum Wall. = Clerodendrum colebrokianum Walp.
Clerodendron gratum Kurz = Caryopteris paniculata C. B. Clarke
Clerodendron gratum Wall. = Caryopteris grata Benth.
Clerodendron hereophyllum Miq. = Peronema canescens Jack
Clerodendron inermis Gaertn. = Clerodendrum inerme (L.) Gaertn.
Clerodendron macrostachyum Turcz. = Clerodendrum macrostachyum
 Turcz.
Clerodendron paniculata L. = Clerodendrum paniculatum L.
Clerodendron petasites S. Moore = Clerodendrum petasites (Lour.) S.
 Moore
Clerodendron robecchii Chiov. = Clerodendrum robecchii Chiov.
Clerodendron robecchii var. macrophyllum Chiov. = Clerodendrum
robecchii var. macrophyllum Chiov.
Clerodendron sansibarense Gürke = Clerodendrum sansibarense Gürke
Clerodendron semiserrata Wall. = Clerodendrum indicum f. semiser-
ratum (Wall.) Moldenke
Clerodendron semiserratum Wall. = Clerodendrum indicum f. semi-
serratum (Wall.) Moldenke
Clerodendron similis Merr. = Clerodendrum mindorense Merr.
Clerodendron siphonanthus var. semiserrata C. B. Clarke = Clero-
dendrum indicum f. semiserratum (Wall.) Moldenke -- this is
 the corrected entry
Clerodendron siphonanthus var. semiserrata (Wall.) C. B. Clarke =
Clerodendrum indicum f. semiserratum (Wall.) Moldenke
Clerodendron squamatum var. urticifolia C. B. Clarke = Cleroden-
drum urticifolium (Roxb.) Wall.
Clerodendron thompsonii Hook. = Clerodendrum thomsonae Balf. f.
Clerodendron thomsoniae x C. splendens Adams = Clerodendrum umbel-
latum var. speciosum (Dombroin) Moldenke
Clerodendron trichostomum Hansford = Clerodendrum trichotomum
 Thunb.
Clerodendron ?trichotomum Wall. = Clerodendrum villosum Blume
Clerodendron verticillata Don = Clerodendrum indicum (L.) Kuntze
Clerodendron yambesiaceum Baker = Clerodendrum guerkei J. G. Baker
Clerodendron sp. L. = Clerodendrum infortunatum L.
Clerodendron sp. n. 563 W. Griff. = Clerodendrum bracteatum Wall.
Clerodendrum acerbium (Vis.) Benth. & Hook. = C. acerbium (Vis.)

ian.) Benth.

Clerodendrum buchananii Roxb. = C. buchanani (Roxb.) Walp.

Clerodendrum inermi Farnsworth = C. inermis (L.) Gaertn.

Clerodendrum macrosiphon Hook. = C. incisum var. macrosiphon
(Hook. f.) J. G. Baker

Clerodendrum minnahassae Buswell = C. minahassae Teijsm. & Binn.

Clerodendrum phlomides L. f. = C. phlomidis L. f.

Clerodendrum phlomoides L. = C. phlomidis L. f.

Clerodendrum speciosissimum Van Beert. = C. speciosissimum Van
Geert

Clerodendrum triplinerva Rolfe = C. triplinerve Rolfe

Clerodendrum ugandensis Prain = C. ugandense Prain

Gmelina Caudhuri = Gmelina L.

Congea tomentosa var. coerulea (Griff.) Clarke = C. tomentosa Roxb.

Congea velutinus Wight = C. velutina Wight

Congea sp. W. Griff. = Sphenodesme involucrata (Presl) B. L. Rob-
inson

Cornutia grandifolia var. quadrangularis Moldenke = C. grandifolia
var. quadrangularis Ørst. & Moldenke

Cornutia pyramidata var. ismithia Moldenke = C. pyramidata var.
isthmica Moldenke

Diototheca repens Raf. = Phyla nodiflora var. reptans (Spreng.)
Moldenke -- this is the corrected entry

Duranata Dennis = Duranta L.

Duranata mitisii Dennis = Duranta mutisii L. f.

Duranta plunieri "A. B." = D. repens L.

Elaeagnon theophrasti Lob. = Vitex agnus-castus L.

Erimus laciniatum L. = Verbena laciniata (L.) Briq.

Erimus peruvianus L. = Verbena peruviana (L.) Britton

Eriocaulon callocephalum Alv. Silv. = E. ligulatum (Vell.) L. B.
Sm. -- this is the corrected entry

Eriocaulon elichrysoides Kunth = E. ligulatum (Vell.) L. B. Sm. --
this is the corrected entry

Eriocaulon heudeloti N. E. Br. = E. heudelotii N. E. Br.

Eriocaulon kunthii Körn. = E. ligulatum (Vell.) L. B. Sm. -- this
is the corrected entry

Eriocaulon kunthii var. j Körn. = E. ligulatum (Vell.) L. B. Sm. --
this is the corrected entry

Eriocaulon kunthii var. ♂ Körn. = E. ligulatum (Vell.) L. B. Sm.
-- this is the corrected entry

Eriocaulon kunthii var. ♀ Körn. = E. ligulatum (Vell.) L. B. Sm. --
this is the corrected entry

Eriocaulon kunthii var. Y Körn. = E. ligulatum (Vell.) L. B. Sm. --
this is the corrected entry

Eriocaulon richardi Körn. = E. abyssinicum Hochst.

Eriocaulon richardii Körn. = E. abyssinicum Hochst. -- this is the
corrected entry

Eriocaulon sexangulare Auct. [ex Cuf.] = E. abyssinicum Hochst.

Eriocaulon sexangulare Auct. [ex Ruhl.] = E. cinereum R. Br. —

this is the corrected entry

Eriocaulon willdenowianum Moldenke = E. willdenovianum Moldenke

Gesneria pilosa Glaz. = Amasonia hirta Benth.

Gesneria pilosa Glaz. = Amasonia hirta Benth.

Ghinia spicata Moldenke = G. spicata (Aubl.) Moldenke

Glandularia J. G. Agardh -- a section of Sargassum C. Agardh, Fu-
caceae

Glandularia ambrosifolia Schnack & Covas = Verbena ambrosifolia
Rydb.

Glandularia cabreræ (Mold.) Tronc. = Verbena cabreræ Moldenke

Glandularia canadensis L. Small = Verbena canadensis (L.) Britton

Glandularia dissecta (Willd. ex Spreng.) Schnack & Covas = Verbena
dissecta Willd.

Glandularia elegans Solbrig = Verbena elegans H.B.K.

Glandularia elegans x peruviana Solbrig -- see under Verbena ele-
gans H.B.K. x V. peruviana (L.) Britton

Glandularia elegans x pulchella Solbrig -- see under Verbena ele-
gans H.B.K. x V. pulchella Sweet

Glandularia elegans x stellaroides Solbrig -- see under Verbena
elegans H.B.K. x V. stellarioides Cham.

Glandularia megapotamica Schnack & Covas = Verbena megapotamica
Spreng.

Glandularia microphylla Schnack & Covas = Verbena microphylla H.B.K.

Glandularia peruviana x megapotamica Schnack & Covas = xVerbena
schnackii Moldenke

Glandularia pinnatiloba Schnack & Rubens = Verbena pinnatiloba
(Kuntze) Moldenke

Glandularia pulchra Mold. = Verbena pulchra Moldenke

Glandularia pulchella x peruviana Solbrig -- see under Verbena
peruviana (L.) Britton x V. pulchella Sweet

Glandularia santiaguensis Covas & Schnack = Verbena santiaguensis
(Covas & Schnack) Moldenke

Glandularia santiaguensis x G. peruviana Schnack & Covas -- see un-
der Verbena santiaguensis (Covas & Schnack) Moldenke x V.
peruviana (L.) Britton

Glandularia sessilis (Cham.) Tronc. = Verbena sessilis (Cham.)
Kuntze

Glandularia sessilis Schnack & Rubens = Verbena sessilis (Cham.)
Kuntze

Glandularia stellatioides (Cham.) Schnack & Covas = Verbena stel-
larioides Cham.

Glandularia sulfurea (D. Don) Schnack & Covas = Verbena sulphurea
D. Don

Glandularia tenuisecta Small = Verbena tenuisecta Briq.

Glossocarya linnaei Benth. = G. scandens (L. f.) Moon
Gmelina asiatica Wall. [in part] = G. elliptica J. E. Sm.
Gmelina filipensis Cham. = G. philippensis Cham.
Gmelina sp. n. 2 W. Griff. = G. elliptica J. E. Sm.
Hastingia coccinea König = Holmskioldia sanguinea Retz.
Hastingia scandens Roxb. = Holmskioldia sanguinea Retz.
Hippia aegyptiaca Delchev. = Phyla nodiflora var. reptans (Spreng.)

Moldenke -- this is the corrected entry
Holmskioldia sangiunea Retz. = H. sanguinea Retz.
Holmsköldia Retz. = Holmskioldia Retz.
Holmsköldia sanguinea Retz. = Holmskioldia sanguinea Retz.
Hymenofyramus Wall. = Hymenopyramis Wall.
Hymenofyramus siamensis Wall. = Hymenopyramis siamensis Craib
Hymenospiranis Wall. = Hymenopyramis Wall.
Hymenospiranis brachiata Wall. = Hymenopyramis brachiata Wall.
Junellia glauca var. cisandina Niederl. = J. glauca var. cisandina (Niederlein) Moldenke
Lantana cujabensis var. punctuata Moldenke = L. cujabensis var. punctata Moldenke

Lantana horrida var. parviflora Schau. = L. horrida H.B.K.
Lantana jamaicensis x reticulata Adams = L. fucata var. antillana Moldenke
Lantana lasiocarycina Goodland = Lippia lasiocalycina Cham.
Lantana megapotamica (Spreng.) Tronc. = L. montevidensis (Spreng.) Briq.

Lantana mondevidensis (Spreng.) Briq. = L. montevidensis (Spreng.) Briq.

Lantana nana Price = L. camara var. hybrida (Neubert) Moldenke
Lantana ovatifolia var. ovatifolia Britton = L. ovatifolia Britton
Lantana ovatifolia var. reclinata R. W. Long = L. depressa Small
Lantana repens Sessé & Moc. = Phyla nodiflora var. reptans (Spreng.) Moldenke -- this is the corrected entry

Lantana reticulata x jamaicensis Stearn = L. fucata var. antillana Moldenke

Lantana semantha Pettingill = L. camara L.
Lantana urticifolia Mill. = L. urticaefolia Mill.
Lantana zahlbruckneri Hayek = L. zahlbruckneri Hayek
Lippia Endl. = Phyla Lour.

Lippia aegyptiaca Carr. = Phyla nodiflora var. reptans (Spreng.) Moldenke -- this is the corrected entry

Lippia aegyptiaca Delchev. = Phyla nodiflora var. reptans (Spreng.) Moldenke -- this is the corrected entry

Lippia alba (Mill.) N. E. Briq. = L. alba (Mill.) N. E. Br.

Lippia asperifolia asperifolia A. Rich. ex Marthe = L. javanica (Burm. f.) Spreng.

Lippia bolandieri Schau. = L. graveolens H.B.K.

- Lippia canescens Rich. = Phyla nodiflora var. reptans (Spreng.)
Moldenke -- this is the corrected entry
- Lippia canescens Robinson = Phyla nodiflora var. reptans (Spreng.)
Moldenke -- this is the corrected entry
- Lippia citridora H.B.K. = Aloysia triphylla (L'Hér.) Britton
- Lippia dulcis mexicana Kraemer = Phyla scaberrima (A. L. Juss.)
Moldenke
- Lippia gerhtii Moldenke = L. gerhtii Moldenke
- Lippia gerthii Angely = L. gerhtii Moldenke
- Lippia grandifolia Hochst. ex A. Rich. = L. grandifolia Hochst.
- Lippia lanceolata Rose = Phyla nodiflora var. reptans (Spreng.)
Moldenke -- this is the corrected entry
- Lippia ligustrina Kearney & Peebles = Aloysia gratissima (Gill. & Hook.) Troncoso
- Lippia nodiflora Eggers = Phyla nodiflora var. reptans (Spreng.)
Moldenke -- this is the corrected entry
- Lippia nodiflora Millsp. = Phyla nodiflora var. reptans (Spreng.)
Moldenke -- this is the corrected entry
- Lippia nodiflora Robinson & Greenm. = Phyla nodiflora var. reptans (Spreng.) Moldenke -- this is the corrected entry
- Lippia nodiflora var. repanda (H.B.K.) Kuntze = Phyla nodiflora var. reptans (Spreng.) Moldenke -- this is the corrected entry
- Lippia nodiflora var. reptans (H.B.K.) Kuntze = Phyla nodiflora var. reptans (Spreng.) Moldenke -- this is the corrected entry
- Lippia reptans Humb. = Phyla nodiflora var. reptans (Spreng.)
Moldenke -- this is the corrected entry
- Lippia reptans Humb. & Bonpl. = Phyla nodiflora var. reptans (Spreng.) Moldenke -- this is the corrected entry
- Lippia reptans H.B.K. = Phyla nodiflora var. reptans (Spreng.)
Moldenke -- this is the corrected entry
- Lippia reptans Humb. & Kunth = Phyla nodiflora var. reptans (Spreng.) Moldenke -- this is the corrected entry
- Lippia reptans Kunth = Phyla nodiflora var. reptans (Spreng.)
Moldenke -- this is the corrected entry
- Lippia reptans L. = Phyla nodiflora var. reptans (Spreng.) Moldenke -- this is the corrected entry
- Lippia reptans (Spreng.) H.B.K. = Phyla nodiflora var. reptans (Spreng.) Moldenke
- Lippia saturejaefolia Mart. & Schau. = L. satureiaefolia Mart. & Schau.
- Lippia seriphioides (Mold.) A. Gray = Acantholippia seriphioides (A. Gray) Moldenke
- Lippia trifida var. gracilis Phil. = Acantholippia deserticola (R. A. Phil.) Moldenke
- Litsea luzonica Blanco = Symphorema luzonicum (Blanco) Fern.-Vill.
- Luehea speciosa Willd. -- in the Tiliaceae

Mesanthemum rosenii Pax = M. roseni Pax.

Nyctanthaceae Kundu = Nyctanthaceae Kundu & De

Nyctanth[ac]eae J. G. Agardh = Nyctanthaceae Kundu & De -- this is the corrected entry

Nyctanthaeae J. G. Agardh = Nyctanthaceae Kundu & De -- this is the corrected entry

Obletia verbenolacoea Rozier = Verbena canadensis (L.) Britton

Paepalanthus calaussianus Körn. = P. clausenianus Körn.

Paepalanthus lamarckii Knuth = P. lamarckii Kunth

Petraea violacea Angely = Petunia violacea Lindl., Solanaceae

Petraevitex trifolia Merr. = Petraevitex trifoliata Merr.

Petrea arborea var. Broadway Chittenden = P. arborea var. broadwayi Moldenke

Petrea aspera L. = P. aspera Turcz.

Petrea kohautiana var. anomalo Chittenden = P. kohautiana var. alba (Freeman & Williams) Moldenke

Phyla Lourt. = Phyla Lour.

Phyla betulaefolia Greene = P. betulaefolia (H.B.K.) Greene

Phyla nodiflora var. reptans (H.B.K.) Moldenke = P. nodiflora var. reptans (Spreng.) Moldenke

Phyla nodiflora reptans (H.B.K.) Moldenke = P. nodiflora var. reptans (Spreng.) Moldenke -- this is the corrected entry

Phyla nodifloros var. reptans (H.B.K.) Moldenke = P. nodiflora var. reptans (Spreng.) Moldenke -- this is the corrected entry

Phyla reptans Greene = P. nodiflora var. reptans (Spreng.) Moldenke -- this is the corrected entry

Phyla reptans H.B.K. = P. nodiflora var. reptans (Spreng.) Moldenke

Phyla reptans (H.B.K.) Greene = P. nodiflora var. reptans (Spreng.) Moldenke -- this is the corrected entry

Phyla stochadaefolia (L.) Small = P. stoechadifolia (L.) Small

Phyla strigosa (Mart. & Gal.) Moldenke = P. strigulosa (Mart. & Gal.) Moldenke

Phyla strigulosa var. parviflora Moldenke = P. strigulosa var. sericea (Kuntze) Moldenke

Phyla yucatanana var. parviflora Moldenke = P. strigulosa var. sericea (Kuntze) Moldenke

Phylla incisa Williams = Phyla incisa Small

Phylla scaberrima (A. L. Juss.) Moldenke = Phyla scaberrima (A. L. Juss.) Moldenke

Premna integrefolia L. = P. obtusifolia R. Br.

Salix amerina Diosc. = Vitex agnus-castus L.

Szegleewia luconiensis Turcz. = Symphorema luzonicum (Blanco) Fern.-Vill.

Sherardia nodiflora, fruticosa, foliis subrotundis serratis Houst.

[in part] = Phyla nodiflora var. reptans (Spreng.) Moldenke --

this is the corrected entry

- Spartothamnella juncea Briq. = S. juncea (A. Cunn.) Briq.
Sphenodesma ? Wall. = Sphenodesme eryciboides Kurz
Sphenodesma acuminata Wight = Sphenodesme pentandra Jack
Sphenodesma eryciboides Kurz = Sphenodesme eryciboides Kurz
Sphenodesma ferrugineum Wight = Sphenodesme racemosa (Presl) Moldenke
Sphenodesma grossum Kurz = Sphenodesme eryciboides Kurz
Sphenodesma jackianum Wight = Sphenodesme griffithiana Wight
Stachytarphaeta cayenensis (L. C. Rich.) Vahl = Stachytarpheta cayennensis (L. C. Rich.) Vahl
Stachytarpheta hintonii Moldenke = S. hintoni Moldenke
Stilbe albiflora f. pilosa A. DC. = S. albiflora E. Mey.
Sympharema Vill. = Symphorema Roxb.
Sympharema luzonicum (Blanco) Vill. = Symphorema luzonicum (Blanco) Fern.-Vill.
Symphorema involucratum Kew = S. polyandrum Wight
Symphorena F.-Vill. = Symphorema Roxb.
Symphorena luzonicum F.-Vill. = Symphorema luzonicum (Blanco) Fern.-Vill.
Syngonanthus ceranthemoides (Bong.) Ruhl. = S. xeranthemoides (Bong.) Ruhl.
Syngonanthus densiflorus var. gabresc Anon. = S. densiflorus var. glabrescens Moldenke
Tectona philippinensis Imam = T. philippinensis Benth.
Tetrandra, spicis filiformibus paniculatis, foliis multifido-laciniatis caule solitario Willd. = Verbena officinalis L.
Teucrium paucifolium A. Cunn. = T. parvifolium Hook. f.
Timotecia Moldenke = Casselia Nees & Mart.
Timotecia confertiflora Moldenke = Casselia confertiflora (Moldenke) Moldenke
Urbania eganioides Phil. = U. egaffioides R. A. Phil.
Veraena Lam. = Verbena [Dorst.] L.
Veraena erinoides Lam. = Verbena laciniata (L.) Briq.
Verbena americana, spici multiplici, foliis urticae angustissimis, floribus purpureis Tourn. = V. hastata L.
Verbena aukletia Jacq. = V. canadensis (L.) Britton
Verbena beipinnatifida Nutt. = V. bipinnatifida Nutt.
Verbena bininnafillia Abrigo = V. bipinnatifida Nutt.
Verbena bipinnatifolia Nutt. = V. bipinnatifida Nutt.
Verbena bracteosa x hastata Rydb. = xV. crookshanksi Moldenke —
 this is the corrected entry
Verbena brasiliense Vell. = V. brasiliensis Vell.
Verbena clemensorum Moldenke = xV. clemensorum Moldenke
Verbena communis caeruleo flore Zannich. = V. officinalis L.
Verbena communis caeruleo flore (foliis dissectis) Micheli = V.

officinalis L.

Verbena communis, flore caeruleo Cup. = V. officinalis L.

Verbena drummondii Grey = V. canadensis (L.) Britton

Verbena elata Jan = V. alata Sweet

Verbena ericoides Macself = V. tenuisecta Briq.

Verbena foemina Brunf. = Senecio vulgaris L., Carduaceae

Verbena foemina Trag. = Sisymbrium officinale L., Brassicaceae

Verbena foliis laciniatis superioribus, tripartitis, spicis angustis longissimis Haller = V. officinalis L.

Verbena foliis tripartitis, rugosis, spicis nudis gracillimis Haller = V. officinalis L.

Verbena fruticosa Mill. [in part] = Phyla nodiflora var. reptans (Spreng.) Moldenke -- this is the corrected entry

Verbena fruticosa Millsp. [in part] = Phyla nodiflora var. reptans (Spreng.) Moldenke -- this is the corrected entry

Verbena fruticosa Mill. [in part] = Phyla nodiflora var. reptans (Spreng.) Moldenke -- this is the corrected entry

Verbena frutescens Mill. & Houst. [in part] = Phyla nodiflora var. reptans (Spreng.) Moldenke -- this is the corrected entry

Verbena glauca Gill. = Junellia selaginoides (Kunth) Moldenke

Verbena globifera Nocca = Phyla nodiflora var. reptans (Spreng.)

Moldenke -- this is the corrected entry

Verbena gooddingii nepetifolia Tidestr. = V. gooddingii var. nepetifolia Tidestr.

Verbena goodmanii Moldenke = xV. goodmani Moldenke

Verbena hastata f. hastata Seymour = V. hastata L.

Verbena hastato-urticifolia Bebb = xV. engelmannii Moldenke

Verbena hybrida cv. drandiflora Hort. = xV. hybrida Voss

Verbena lusitanica, latifolia, procerior Tourn. = V. officinalis L.

Verbena macdougalii Shinn = V. macdougalii Heller

Verbena megapotamica var. phlogiflora Cham. = V. phlogiflora Cham.

Verbena melindre Schau. = V. peruviana (L.) Britton

Verbena officinalis L. x Veronica maritima L. = Veronica spuria L., Scrophulariaceae -- this is the corrected entry

Verbena offinalis Cham. = V. officinalis L.

Verbena offinalis var. glabrescens Cham. = V. glabrescens (Cham.)

Herter

Verbena peruviana Moldenke = V. peruviana (L.) Britton

Verbena peruviana 'Chiquita' Graf = V. tenera var. maonetti Regel

Verbena phlogiflora Cham. emend. Moldenke = V. phlogiflora Cham.

Verbena plicata var. plicata Devor = V. plicata Greene

Verbena recta sive mas Fuchs = Sisymbrium officinale L., Brassicaceae

Verbena sacra Gerarde = V. supina L. -- this is the corrected entry

Verbena santiaguensis Darlington & Wylie = V. santiaguensis (Covas &

Schnack) Moldenke

Verbena sphedroides Angely = V. sphedroides Cham.

Verbena sulphurea f. fuscorubra Skottsberg = V. sulphurea var. fuscorubra Skottsberg

Verbena supina Dodon. = V. supina L.

Verbena tenera mahonetti Hay & Syngé = V. tenera var. maonetti Regel

Verbena tenuifolia Tourn. = V. supina L.

Verbena tetrandra spicis filiformibus, paniculatis, foliis multifido laciniatis, caule solitario L. = V. officinalis L.

Verbena townsendi Svenson = V. townsendii Svenson

Verbena triphylla Lam. = Aloysia triphylla (L'Hér.) Britton

Verbena urticae-folia, canadensis, foliis incisis, flore majore Tourn. = V. officinalis L.

Verbena urticifolia angustifolia Bebb = xV. moechina Moldenke

Verbena urticifolia-hastata Bebb = V. hastata L.

Verbena vulgo appellata Ang. = V. officinalis L.

Verbena n. 219 Haller = V. officinalis L.

Verbenaca recta Dodon. = Verbena officinalis L.

Verbenaca supina Dodon. = Verbena supina L.

Verbenaca supina Gesn. = Ajuga sp., Lamiaceae -- this is the corrected entry

Verbenaca supina sive foemina Fuchs = Verbena supina L.

Verbenaca volgare del Matthioli Pon. = Verbena officinalis L.

Verbenna americana tubo floris longissimo Rozier = Verbena canadensis (L.) Britton

Verbenna frummondii Baxt. = Verbena canadensis (L.) Britton

Verbina officinalis L. = Verbena officinalis L.

Vermicularia Tode -- in the Melanconiaceae

Vermicularia Tode ex Fries = Vermicularia Tode, Melanconiaceae

Vermicularia pseudosphaeria Tode -- in the Melanconiaceae

Vermicularia pubescens Tode -- in the Melanconiaceae

Veronica spuria Haartm. = V. spuria L., Scrophulariaceae -- this is the corrected entry

Vervena Kundu & De = Verbena [Dorst.] L.

Viter Aubreville = Vitex Tourn.

Viter fosteri Aubreville = Vitex ferruginea Schum. & Thonn.

Vitex Trag. = Vitex Tourn.

Vitex agnus castus var. trifolia Kurz = V. trifolia L.

Vitex agnus-castus var. latifolia (Mill.) Loud. = V. agnus-castus f. latifolia (Mill.) Rehd.

Vitex agnus-castus var. rosea Rehd. = V. agnus-castus f. rosea Rehd.

Vitex agnus-castus β laciniosa Ces. = V. agnus-castus var. laciniosa Ces.

Vitex agnus-castus 'Latifolia' McGourty = V. agnus-castus f. lat-

ifolia (Mill.) Rehd.

Vitex altissima (f. subglabra) Thwaites = V. altissima f. subglabra Thwaites

Vitex cunninghamii Schau. = V. glabrata R. Br.

Vitex gigantia H.B.K. = V. gigantea H.B.K.

Vitex heterophylla Kurz = V. quinata (Lour.) F. N. Will.

Vitex laciniosa Arcang. = V. agnus-castus var. laciniosa Ces.

Vitex negundo "Heterophylla" Sherk & Buckley = V. negundo var. heterophylla (Franch.) Rehd.

Vitex sex-dentata Wall. = Caryopteris grata Benth.

Vitex n. 12 Hook. f. & Thoms. = V. urceolata C. B. Clarke

Vitex n. 18 Hook. f. & Thoms. = V. leucoxydon L. f.

Vitex nn. 10 and 18 Hook. f. & Thoms. = V. glabrata var. bombacifolia (Wall.) Moldenke

Vitex nn. 15, 16 Hook. f. & Thoms. = V. gamosepala W. Griff.

Volkameria urticifolia Wall. = Clerodendrum urticifolium (Roxb.) Wall.

Volkameria sp. W. Griff. = Clerodendrum venosum Wall. & Caryopteris odorata (Hamilt.) B. L. Robinson

Zapania nodiflora Spreng. = Phyla nodiflora var. reptans (Spreng.) Moldenke — this is the corrected entry

Zapania reptans Spreng. = Phyla nodiflora var. reptans (Spreng.) Moldenke — this is the corrected entry

Addenda and errata to Parts IV, V, VI, VII, VIII, and X will not be published at this time, with the single exception that an inaccurate statement on page 786 should be corrected. Dr. Otto Degener informs me that it is not his policy to use a double author citation when a taxon is shifted from a binomial with an incorrectly spelled generic portion to one with the "corrected" generic name. He informs me that if he did this in any instance in the past it was merely in an effort to comply with the International Code as it existed at that time. This, then, conforms with my policy also in such cases where there are "orthographic variants" of generic names, e.g., Clerodendron vs. Clerodendrum and Sphenodesma vs. Sphenodesme.

It is perhaps worthwhile to mention here that a few complete copies of the original "Fifth Summary", 974 pages, in 2 volumes, are still available and may be ordered direct from either Editor of PHYTOLOGIA for \$25 plus 80 cents postage & wrapping (U.S.A. addresses) or \$1.62 postage & wrapping (foreign addresses).

NEW NAMES AND A NEW COMBINATION IN SOUTH AMERICAN LINUM (LINACEAE)

R. Mildner & C. M. Rogers, Wayne State University, Detroit, Mich.

During the course of revising the native South American species of Linum, the following new names and new combination have been found necessary.

L. SMITHII Mildner, sp. nov. Species affinis L. organensi a qua stipulis glandulosis, sepalis denticulatis, foliis in inflorescentia redactis differt. Type: Reitz & Klein 7999, Brazil: Bom Jardim, Santa Catarina (holotype: UC!; isotypes: G!, NY!, US!). The specific epithet is given in honor of Lyman B. Smith, one of the collectors, and, among his many interests, a student of the flora of Santa Catarina.

L. smithii is found in eastern portions of the states of Santa Catarina and Rio Grande do Sul in southern Brazil.

L. BURKARTII Mildner, sp. nov. Herba 18-50 cm. alta; sepala ovata, acuminata, 3.7-4.4 mm. longa, glandulosa-denticulata; stipulae glandulosae nullae; styli liberi, 3.5-4.5 mm. longi; fructus ovatus, acutus, 2.2-2.5 mm. longus. Type: Rosengurt 5755, Uruguay: Florida (holotype: SP!; isotype: MVM!). The specific epithet is given in honor of Arturo Burkart, longtime student of the flora of Argentina.

L. burkartii is found in southern Uruguay and in Entre Rios and Buenos Aires provinces of eastern Argentina.

L. PROSTRATUM Domb. ex Lam. var. PARVUM (Johnst.) Mildner, comb. nov. Type: Johnston 3549, Peru: Mollendo (holotype: GH!)

L. parvum Johnst., Cont. Gray Herb. 85: 172. 1929.

L. MACRAEI Benth. var. MARTICORENAE Mildner, var. nov. A var. macraei caulibus pubescentibus, habitu humili et compacto differt. Type: Mildner 15a, Chile: open grassy fields and roadcuts, about 23 km. from Concepcion on road to Chillan (holotype: US!; isotypes: CONC!, K!, UC!, WUD!). The varietal epithet is given in honor of Prof. C. Marticorena, student of the flora of Chile, who was most helpful to the senior author while he was collecting in the Concepcion area.

Var. marticorenae is found near the coast in Chile, from Valparaiso southward to a few km. south of Concepcion.

Field work in South America was supported in part by a Sigma Xi Grant-In-Aid of Research to the junior author.

SECOND EXPEDITION TO NICARAGUA, 1969-1970

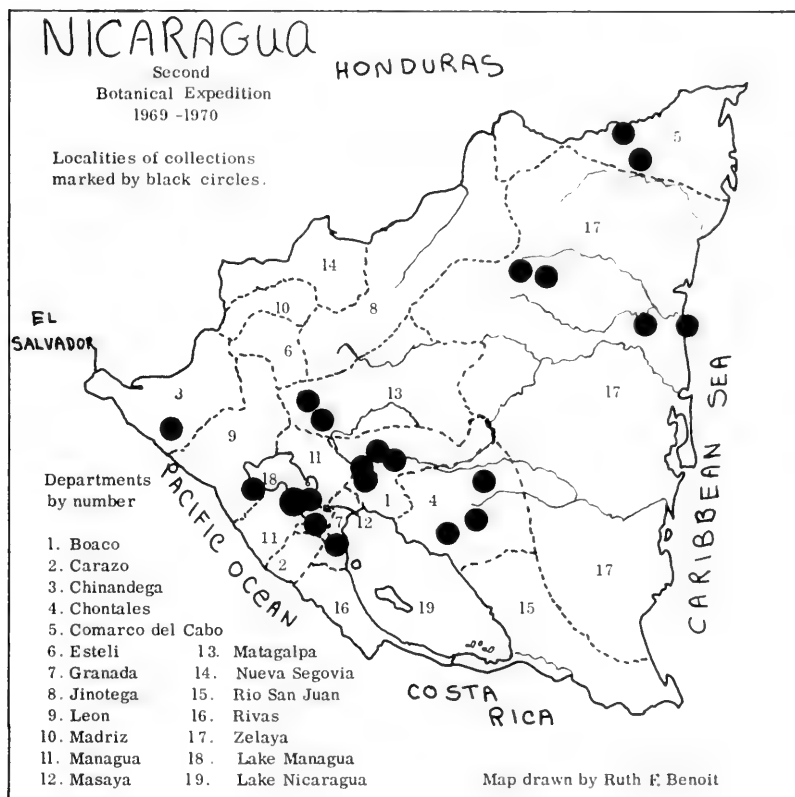
Frank C. Seymour

That the flora of Nicaragua is rich in variety is one of the features which attracts botanists to return again and again. A large factor in providing such variety may be the extremes of rainfall. At one extreme the rainfall is reported by B. W. Taylor as zero during the month of February in Managua. At the other extreme is San Juan del Norte, on the east coast at the mouth of Rio San Juan, where the joking remark is that it rains all the time. There 823 mm of rain are reported during July.

Differences of soil must account for some of the variety in flora. Clay appears to be the most widely distributed soil, but volcanic ash and even volcanic clinkers are conspicuous types, while large tracts of land such as those at Waspan and between Siuna and Limbaikan are characterized by sand. B. W. Taylor has estimated that the number of species mounts up to 10,000 although the area of the whole country is smaller than New England, which, with a notably varied flora, supports only about 2900 species, about .043 per square mile. Nicaragua, with its 57,915 square miles and 10,000 species, accordingly can boast of .172 species per square mile. This is in spite of the fact that 3,475 square miles of its area are covered by water. Thus if the estimate is not too high, Nicaragua luxuriates in about four times as many species per square mile than New England.

The personnel of this second expedition consists of only three men, all of whom participated in the first expedition. The three are: (1) Frank C. Seymour, the writer of this article, then associate curator of the Pringle Herbarium of the University of Vermont; (2) John T. Atwood, Jr., then a graduate student in the University of Vermont, majoring in botany; (3) Eduardo Narvaez S., then a student in the Escuela Nacional de Agricultura y Ganaderia in Managua. Members of the first expedition who were unable to return were deterred mostly for financial reasons. We have been unable to find a foundation which could make us any grant, with the result that each member of our party had to pay his own expenses.

Acknowledgements. For identifications, we are indebted to Dr. Henry K. Svenson for Cyperaceae; to Mr. John T. Atwood for Orchidaceae; to Dr. Lyman B. Smith and Mr. Atwood for Bromeliaceae;



to Dr. Harold N. Moldenke for Verbenaceae; to Dr. R. M. Tryon for some Pteridophyta; to Dr. Bernice G. Schubert for Desmodium.

The dates of the second expedition, Dec. 15, 1969 to Jan. 29, 1970 were only two weeks later in the season than the first, chosen largely because it was the time of college vacations when students could come.

On December 15, 1969, Seymour left Burlington, Vermont, by airplane, arriving in Managua the next day. For five days he collected alone, until, on December 20, Atwood joined him in a trip to Teustepe. By December 23, Narvaez joined us. On the trip to Sebaco, Placido Medina B., a student in the same Escuela Nacional, collected with the other three.

We wish to express our appreciation again to Dr. Gustavo Jarquin B., then director of the Escuela Nacional de Agricultura y Ganaderia and his staff for their generous hospitality in welcoming us to their dormitory and making available to us the facilities of their botanical laboratory.

A day-by-day record of our collections follows. At the end of a day's record are given the collection numbers of each person.

Dec. 15. Managua, Route 1, in the region of the Escuela Nacional de Agricultura y Ganaderia. This is a remarkable area for its rich black soil and abundant water supply under ground. On this, the first day of arrival, only a few roadside weeds were taken. Seymour 2333-2340.

Dec. 16. Tipitapa, Route 1, just a few kilometers east of the Escuela and with the same type of habitat, including a shallow muddy pond, a cotton field and a swampy meadow. Eichornia azurea (Sw.) Kunth and Tithonia rotundifolia (Miller) Blake were flourishing. Seymour 2341-2347

Dec. 16. Potrerillos, Dept. Boaco, Route 7. A fault line extending approximately from the Gulf of Fonseca in the northwest to San Juan del Norte in the southeast, runs about 20 km east of Tipitapa. East of this fault line, one enters a region of very dry infertile soil where lies the tiny village of Potrerillos. Altho it is in the Dept. of Boaco, the soil and vegetation are extraordinarily different from the rain-forests and lush growth of the eastern part of Dept. Boaco. Collections in Potrerillos were made along the roadside and in a stony field. Characteristic species were Amaranthus scariosus Bth. and Jacquinia pungens Gray. Seymour 2348-2371.

Dec. 17. No collecting.

Dec. 18. Managua, near the above-named Escuela, which will be referred to in the following pages simply as the Escuela. Seymour 2372-2376.

Dec. 18. Nagarote, Dept. Leon, on the unnumbered route. Altho this locality was chosen because it was near to Lake Managua (not more than 3 km from the western shore), the soil was parched and dry, consisting of fine volcanic ash. Unlike the region of the Escuela and Tipitapa, here the streams were low and dried up. Altho in the "Area Code", it is designated as "Seasonal Tropical Forest", little forest of any kind was observed. Antigonon leptopus Hk. & Arn. and Tecoma stans (L.) HBK. were conspicuous. Seymour 2377-2392.

Dec. 19. No collecting.

Dec. 20. Teustepe, only 10 km east of Potrerillos on Route 7, also in the Dept. Boaco. Atwood having arrived, Seymour and Atwood, collected at first on the south side of the road, where in spite of scrubby growth, nevertheless the soil was dry and brooks dried up. On crossing to the north side of the highway, we forded the Malacatoya River. Here were far more interesting species including Hymenachne amplexicaulis (Rudge) Nees, Salix chilensis Molina and Muntingia Calabura L. The river here is a wide shallow stream with an abundance of water bubbling over the many loose stones. Atwood 2392-2422. Seymour 2423 - 2457. Unintentionally numbers 2413-2422 were used twice.

Dec. 21. Managua, casual collections near the Escuela. Seymour 2458-2462.

Dec. 22. Near the Escuela, Atwood 2463, Mangifera indica L.

Dec. 23. Sebaco, Dept. Matagalpa, Route 1. At this point, Rio Grande is a small stream but with an abundance of water gliding over a sandy bed. High above its present level, it had left debris in trees and shrubs to show what it could do in the rainy season. Dividing into pairs, Narvaez and Seymour explored downstream, Atwood and Mena upstream. Most of the vegetation was familiar, but Cyperus canus Presl in good fruit was unusual. Atwood 2464-2496. Mena 2497-2521. Narvaez 2522-2529. Seymour 2530-2548.

Dec. 24. Casual collections near the Escuela. Atwood 2549 - 2553. Seymour 2554-2555.

Dec. 25. Calabazas, Dept. Matagalpa, Route 1, 80 km north, a short distance south of Ciudad Dario. Having no apparent means of celebrating Christmas, keeping busy collecting was the best antidote for homesickness. For the first time we met a crowd of men, naturally

not at work on this holiday. Habitats were, as usual, parched. A tiny pond, mostly dried up, still retained some soft black muck. Exposed clay mud had been baked hard.

Seymour having dropped his knapsack onto a low clump of bushes thought nothing of it until a group of men began showing an extraordinary interest in it. They flourished their machettes and pulled out a snake ! It was a harmless species. This was one of the few times when we saw any snake, dead or alive. Atwood 2556-2573. Seymour 2574-2603.

Dec. 26. Managua, Route 1. The Escuela being not far from the shore of Lake Managua at its southern end, Seymour, Atwood, and Narvaez attempted to hike across country to the shore. After an interminable walk in the broiling sun, still no lake was in sight, so we gave up the lake and collected a few numbers along lanes and in scrubby growth. Climbing a tree we brought down a species of Phoradendron. Nothing appeared more notable than Cyperus panamensis (Clarke) Britton and Fuirena umbellata Rottb. Atwood 2604-2614. Seymour 2622-2629, 2594. Narvaez 2615-2621.

Dec. 27. El Viejo, Dept. Chinandega. For our first sampling of the flora of this department, we collected along a brook near where it empties into the Atoya River. The vegetation proved to be very similar to what we had found all along the dry strip of land a few kilometers east of the Pacific Ocean. Legumes were abundant, among them Desmodium triflorum (L.) DC. and D. procumbens (Miller) Hitchc. We are indebted to Dr. Bernice G. Schubert of the Harvard Herbaria for identifying the specimens of this genus. Atwood 2630-2646. Narvaez 2647-2656. Seymour 2657-2678.

Dec. 28. No collecting.

Dec. 29. The breakdown of buses is not always opportune, but it was this time. In all our travels this is the only time when our bus broke down. As we entered Dept. Chontales along Route 7, where it crosses Cano Gordo, at 150-151 km, our bus came to an unexpected stop. To improve each shining hour, we nearly filled two field presses here while we waited. Hyptis pectinata Poit. and Borreria suaveolens Mey. were growing near the river. Narvaez, better than collecting, helped to persuade the bus to roll again. Atwood 2679-2685. Seymour 2686-2703.

Nicaragua has a very efficient system of locating places along the highway. At intervals of 1 kilometer, posts give the number of kilometers distant from the capital, Managua. What could be more efficient to aid botanists in locating their collections? When near a highway, we used this means of identifying our locality.

A further advantage of the breakdown was that when we arrived in Santo Tomas, Dept. Chontales, in rain-forest, not only had we already made collections, but also we were rested again and ready to start anew. The score for the day in terms of the number of specimens collected became: Atwood 159; Narvaez 124 (a small score because of working on the bus); Seymour 216. Grand total 489.

In Santo Tomas, we sampled a variety of habitats from a low wet spot to an open hillside and a luxuriant thicket. Panicum stoloniferum Poiret was clambering, vine-like, over other vegetation, such as Eleocharis retroflexa (Poiret) Urban. A small scrawny tree yielded Catopsis Berteroana (Schultes f.) Mez and several orchids including Scaphyglottis cuneata Schl. We are indebted to Dr. Henry K. Svenson for identifying our Cyperaceae and to John T. Atwood for identifying our Orchidaceae and many Bromeliaceae; to Dr. Lyman B. Smith for identifying many of our Bromeliaceae. Atwood 2704-2738. Narvaez 2739-2750. Seymour 2751-2804.

Dec. 30. No collecting.

Dec. 31. The region of the Escuela, although much cultivated, yielded a surprising variety. When time was lacking to go farther afield, we took a closer look at some promising spot nearby. So, on this date Seymour and Atwood hiked to a Heliconia swamp over the line in Tipitapa. Sagittaria lancifolia L. was growing luxuriantly as well as Heliconia latspatha Bth. Atwood 2805-2825. Seymour 2826-2847.

Jan. 1, 1970. Near the Escuela again, Seymour 2848, Panicum maximum Jacq.

Jan. 2. By airplane, we descended upon Siuna, a mining community in the northern part of Dept. Zelaya. With not even a breathing time, we boarded a truck and reached Limbaikan (Limbaika) on the Prinzapolka River toward the end of the afternoon. While waiting for a boat to take us down the river, Atwood grabbed some epiphytes and hid them in the crotch of a tree where he found them in fine condition a few days later, on our return trip. To while away the time on the boat, from 6 p. m. until nearly 3 a. m., we studied the stars. On arriving in Puerto Isabel on the coast at the mouth of the river, we fell in bed, too exhausted even to undress. At Limbaikan, Atwood 2849-2853.

Jan. 3. Puerto Isabel, on the Caribbean Coast at the mouth of the Prinzapolka River. Collecting within a few feet of the sea proved very profitable. The land was all very low, and so far as we could see, level. There appeared to be no forest, only scrubby growth and grassland, obviously pastured. Atwood picked up Rhynchospora nitida (Torr.) Wood var. hispaniolica Kukenthal, new to Central America. He and Narvaez

both brought Kyllinga peruviana Rottb., a strikingly characteristic sedge. Seymour added a second sedge new to Nicaragua, Eleocharis Sellowiana Kunth. The large number of Cyperaceae in this locality was very remarkable. Atwood 2854-2881. Narvaez 2882-2893. Seymour 2894-2935.

Jan. 4. Puerto Isabel, again. The second day at this same locality yielded Cephaelis tomentosa (Aubl.) Vahl and Lipocarpa maculata (Mx.) Torr., the latter not found elsewhere. Atwood 2936-2959. Narvaez 2960-2964. Seymour 2965-2991.

Jan. 4. Leaving Puerto Isabel at six o'clock in the evening, we traveled all night by boat up the Prinzapolka River, and via Limbaikan returned to Siuna.

Jan. 5. Siuna. In spite of an almost sleepless night before, we picked up here some of the plants at which we could only gaze longingly two days before as we hurried on our way. This is the place where oranges and grapefruit were lying on the ground in abundance, with no one to pick them up, delicious as they were. We enjoyed the delightful hospitality of the La Luz Mining Co. Emilia sonchifolia (L.) DC. was especially common on a hill in this mountainous region. Eragrostis pusilla Hackel, apparently new to Central America, was so tiny that it took a long time to pick enough for a set. Atwood 2992-3003. Narvaez 3004. Seymour 3005-3021.

Jan. 6 was one of our big days. By the kindness of a member of the mining staff, Mr. Wilbur, we were taken to Mt. Liveco in Madregava. Tropical ferns such as Polypodium crassifolium L., Vittaria minima (Bk.) Benedict, and Adiantum macrophyllum Sw. grew along the gentle trail thru the rain-forest. Olyra latifolia L. was an impressive wide-leaved grass. Numerous epiphytic orchids graced the branches of the trees. Prescottia stachyodes Lindley is one orchid which I think we did not find elsewhere. Hygrophila guianensis Nees at the edge of a small pool was new to us. We collected eagerly. Atwood 3022-3053; Narvaez 3054-3067; Seymour 3068-3106.

Jan. 6. Having put our morning's collections into press while in the field, as was our custom, we were able to take still more plants right near headquarters in the afternoon. The orchid-laden trees and bushes yielded numerous species such as Notylia bicolor Lindley. In a grassy ditch grew Coix lacrima-Jobi L. Atwood 3107-3140; Seymour 3141-3162.

Jan. 7. Siuna. Not to miss one minute of our time, we spent the forenoon hiking along a trail leading from one farm to another. Among plants not seen before were Oplismenus hirtellus (L.) Beauv., a species of Smilax, and Clematis dioica L. Atwood 3163-3179. Narvaez

3180-3185. Seymour 3186-3209, 3284.

Jan. 7. Mt. Liveco, Madregava, again. So great was our success yesterday that our presses were soon so full that we had to pass by many choice plants which we wanted. So we returned to this rain-forest. Scleria latifolia Sw. var. arundinacea (Kunth) is typical of the locality. Several species of Hyptis were there, including H. pectinata Poit. and H. pulegioides Pohl. Perhaps the greatest excitement on this occasion was furnished not by plants. Running back down the trail, where Seymour was collecting, Atwood called, "We've found a snake! Do you want to see it?" Seymour hurried up the trail after him. By a tree festooned with epiphytes, we paused. "It's in there", breathed Atwood. A moment before, he had been exploring those epiphytes with his hand. With a long stick, he pointed and poked, while Narvaez poised with staff raised, ready to strike or run as occasion demanded, and Seymour stared at the epiphytes with popping eyes. Suddenly a tiny brown snake dropped to the ground! We could say that we had seen it; that was enough. It may have been a coral snake, the deadliest of all, but which has so small a mouth that it cannot bite a man except on his little finger or the lobe of his ear. We did not wait for positive identification. Atwood 3210-3239. Narvaez 3240-3247. Seymour 3248-3283, and later, on return to Siuna 3284.

Jan. 8. Siuna. In a few minutes snatched before the plane took off, Seymour 3285-3287.

Jan. 9 & 10. No collecting. Back in Managua, caring for recent collections.

Jan. 11. Lake Masaya, Dept. Masaya. Climbing Mombacho was the order of the day, but we could get no nearer than the city of Granada. Foiled in that attempt, the day was salvaged by revisiting Lake Masaya where we had botanized a year ago. The soil at lake level is composed of volcanic clinkers. Lava cliffs rise abruptly at water's edge, encircling most of the shore as we saw later from an airplane. To this lake came women to do their laundry. On leaving, they climbed the steep cliffs with huge bundles of laundry balanced on their heads. In the clinkers grew Tetramerium hispidum Nees. On the cliff was Bromus exaltatus Bernh. Wigandia caracasana HBK. thrive in the clinkers, a species characteristic of extremely dry soil. Atwood 3288-3300. Narvaez 3301-3303. Seymour 3304-3323.

Jan. 12. Managua, Escuela. Only Seymour 3324.

Jan. 13. Santo Domingo, Dept. Chontales, in a rain-forest on a mountain-side. Coccocypselum hispidulum Standley, new to us grew in abundance along the trail. Most orchids which we have encountered

were epiphytes, but here was Habenaria alata Hooker, a terrestrial species. Of three species of Hyptis, H. recurvata Poirét, had not been encountered before. Likewise there were two species of Scleria, S. pterota Presl var. melaleuca (C. & S.) Standley and S. secans (L.) Urban. To cite an example of the friendliness and hospitality of the people of this country, a friend of Narvaez, Sr. Gracias, received us into his home and made us his overnight guests with very delightful courtesy. Atwood 3325-3355. Narvaez 3356-3376. Seymour 3377-3422.

Jan. 14. No collecting.

Jan. 15. Tipitapa, Dept. Managua. Having but a little time left after retouching day before yesterday's specimens and putting them onto the drier, Atwood and Seymour, yet again, looked around nearby for anything which had been overlooked on previous occasions. An Amaryllis grew in a swamp, too few to enable us to get a set. Panicum molle Sw. was common. Atwood 3423-3431. Seymour 3432-3455.

Jan. 16. Boaco, Dept. Boaco. Along a city street grew a Lepidium. This genus has apparently not become well established, as it was not seen elsewhere (up to that date). Cruciferae, as a family, are scarce in Nicaragua in strong contrast to New England. Seymour 3456.

Jan. 16. Camoapa, Dept. Boaco. Changing buses at Boaco, we rode up hill and down dale again and again, instead of following a valley as roads usually do. As there were no bridges in this very sparsely inhabited region, we forded streams thirteen times by actual count. Altho it was evening when we arrived in Camoapa, we improved the remaining hour of daylight. The sun rises and sets in Nicaragua at about six o'clock the year around. With great courtesy, the proprietor of the hotel, our host, guided Seymour and Atwood to the most likely place for us to find flowers. All the land which we saw had been thoroughly grazed. To find specimens which had not already been partially "collected" by cattle was one of our most persistent problems. Most plants had had at least one branch bitten off. As cows are not giraffes, above a certain height, epiphytes still flourished, such as Catopsis nutans (Sw.) Griseb. and Brassavola nodosa (L.) Lindley, Epidendrum ionophlebium Rehb. and E. chinense (Lindley) Ames. Atwood 3457-3473. Seymour 3474-3505.

Jan. 17. Camoapa, Dept. Boaco. Next morning, rising at daylight to accomplish something before the one bus of the day for Managua left, we returned to about the same spot, but went a little farther. Again the best specimens were epiphytes undisturbed by cattle; they included Leochilus scriptus (Scheidw.) Rehb. f. and Jacquinella globosa Jacq. Cows do not climb cliffs, so above a tiny cliff were two fleshy species of Pe-

peromia, still unidentified. Atwood 3506-3521. Seymour 3522-3540.

Jan. 18. No collecting.

Jan 19. Waspan, Comarca del Cabo, one of the northernmost communities in Nicaragua, is separated from Honduras only by the C o c o River. Across the river, rice is extensively cultivated. A precipitous clay bank drops from the very level land of the town down to the river below, where it is bordered by very low meadows. Most of our collections along the river upstream from the town were very ordinary except Drosera capillaris Poirlet which we found rarely. Salvinia in abundance was floating on a small pool. Dianthera comata L. grew in the swamp. Only Atwood and Seymour came to Waspan. Atwood 3541-3563. Seymour 3564-3595a.

Dr. Robert M. Hooker, a life-time resident of Bluefields informed us that this name should be spelled Waspan because in the early days gold-seekers washed their findings here in pans.

Jan. 20. Waspan, still. Within easy hiking distance was a new type of habitat which we had only glimpsed before, between Siuna and Limbikan. The pines here, Pinus caribaea Morelet, do not grow close together like some other species of pine, but are scattered. Later we were informed that if the land were not burned over frequently, they would grow close together. The ground was covered with standing water, drained a little by a tiny sluggish stream. Sedges were abundant, such as Eleocharis mitrata (Griseb.) Clarke, new to Central America. Rhynchospora flourished in four species, namely, R. rariflora (Mx.) Ell., new to Central America; R. hirsuta Vahl; R. globosa (HBK.) R. & S.; R. divergens Chapman, identification somewhat doubtful, but if correct, a species previously known in Central America only in British Honduras; also R. barbata (Vahl) Kunth, and R. setacea (Berg.) Bückl. Burmannia sp., an Eriocaulon and a Xyris; two species of Utricularia; Hyptis lantanaefolia Poit. and H. conferta Pohl. There were other unusual species too numerous to mention. Atwood 3596-3649. Seymour 3650-3706.

Jan. 21. Cororia Bush, 35 km southwest of Waspan. This locality was sometimes misspelled on our labels; it is correct as given here. After a long ride by jeep, we reached a point where the jeep could go no farther and the vegetation made an abrupt change. The pine-savannas ended abruptly to be replaced westward by rain-forest. Here was a geological fault along which ran Kisalaya Creek. The rain-forest was dense. Far overhead, tree-tops basked in the sunlight but on the ground daylight was dim; shade was so deep that few plants could survive. Only along the borders of the forest was there much to collect. Scleria mitis Berg. had not been found before. Two species of Cephaelis, C.

glomerata D.Sm. and C. tomentosa (Aubl.) Vahl, grew not far apart. This spot yielded another Rhynchospora, R. rugosa (Vahl) Gale, and Dichronema Watsonii Britt. and D. radicans C. & S. and a scrap of Scleria bracteata Cav. In the time available we could nowhere near do justice to this extremely rich and productive area. Atwood 3707- 3745. Seymour. 3746-3811.

Jan. 22. Waspan. Exhausted tho we were from the previous day, Atwood spurred himself to rise early in the morning and gather in a few more specimens before we had to board the plane to return to Managua. These were collected in pine-savannas near the town. Atwood 3812-3817.

Jan. 23. No collecting.

Jan. 24. Escuela. While waiting for a bus, Atwood found Asclepias sp. which we had not found elsewhere. It became more common later in the season. Atwood 3818.

Jan. 24. Boaco, Dept. Boaco. The good places which we drove past in Boaco a year ago without a chance to sample them lured us back on this date for what we feared would be our last trip this year. Climbing a mountain south of the city, we picked a few straggling specimens, at first meeting nothing but heavily grazed slopes. On our squeezing thru a barbed wire fence, everything was changed; we were in a rain-forest near the summit, where the land had not been grazed. Trees were loaded with orchids such as Epidendrum Schlechterianum Ames and E. masayensis. One of the memorable discoveries was a fragrant Adiantum, A. trapeziforme L. Cattleya Skinneri Bateman, Atwood recognized at sight from living flowering plants in his home in Vermont. Umbelliferae as a rule are scarce in areas where we collected, but here was a species of Eryngium. The most interesting species are as yet unidentified. A flock of monkeys were frolicking in the tree-tops far above. Narvaez did not come on this trip. Atwood 3819-3836. Seymour 3837-3879.

Jan. 25-26. By this time we were desparate to get our specimens tied up in bundles and packed for shipping back to Burlington. Therefore there was almost no collecting on these two days.

Jan. 25. Managua, the Escuela. Seymour 3896, Pennisetum ciliare (L.) Link.

Jan 26. Managua, the Escuela. Seymour 3897, Panicum hirticaule Presl.

Jan 27. Managua, the Escuela. Seymour 3898. Antheophora hermaprodita (L.) Kuntze.

Jan. 27. Mombacho, Dept. Granada. To the others, packing seemed well enough along to warrant one more trip, so Seymour continued packing while Atwood and Narvaez made a second attempt to climb this mountain, one of the highest extinct volcanic cones in the country, which we already knew to be rich in tropical vegetation. Reaching the mountain was not too difficult, but time was lacking to attain the summit. Orchids from this mountain included Oncidium Cebolleta (Jacq.) Sw. Ferns were plentiful, among them Polypodium plebejum C.&S. and P. dissimile L. For the return, no vehicle could be commandeered. With heavily loaded presses, the two men, already very tired, had to hike six miles to Granada and arrived at headquarters in the Escuela by bus too tired to speak. Atwood 3899-3924. Narvaez 3880-3895 and 3925-3927.

Jan. 28-29. Managua, the Escuela. Just to mark the fact that we were still in Nicaragua on these dates, Seymour 3929, Atwood 3930-3931, including Oncidium ensatum Lindley.

Nos. 3932-3945 have been assigned to orchids which flowered in Vermont after our return from Nicaragua.

Our first expedition, almost exactly one year earlier was spent largely in the thickly populated dry strip of land near the Pacific Ocean. Our special objective on this second expedition was to explore the eastern part of the country which was characterized by rain-forest. Except for short sallies to make use of odd bits of time when time did not permit us to go far, nearly all of the field work was in rain-forests. Nagarote was one of the few exceptions, selected because we had spent very little time a year ago in Dept. Leon. The other exception is the trip to Chinandega, undertaken because a year ago we did not botanize at all in Dept. Chinandega. Now we have explored to a slight extent every department in the country except Cabo de Gracias a Dios and have spent the largest proportion of our efforts in that most fascinating and largest department, Zelaya.

The Pringle Herbarium

The University of Vermont

Burlington, Vermont 05401

Reference: Taylor, B. W. An Outline of the Vegetation of Nicaragua. Journal of Ecology 51:27-54. 1963.

Pohlia annotina (Hedw.) Lindb. var. loeskei Crum,
Steere and Anderson in Guatemala

Dana Griffin, III
Bryophyte and Lichen Herbarium
University of Florida

Bartram (1949) called attention to several genera and species of northern mosses with disjunct populations in Guatemala. These forms are found at the upper elevations and are thought to represent the result of a migration southward by populations into Mexico and Central America in advance of the glaciers with subsequent isolation at the higher elevations upon retreat of the ice.

To this list of disjuncts may now be added the distinctive taxon, Pohlia annotina (Hedw.) Lindb. var. loeskei Crum, Steere and Anderson. To my knowledge this is the first report of this species south of lat. 34° N.

Crum and Miller (1967) summarized the known distribution of the variety. The plants are fairly common in Europe ranging from the Iberian Peninsula northward to Greenland and Siberia and eastward to Asia Minor. In North America they are found from Alaska to Maine thence southward to Georgia.

Collection data for the Guatemalan plants are as follows:
Pohlia annotina (Hedw.) Lindb. var. loeskei Crum, Steere and Anderson. GUATEMALA: DEPT. OF JALAPA. Ten kilometers east of Mataquescentla along highway 18. Plants on soilbank along roadside. Elevation 2600 m. leg. F. Dixon. 5 Feb. 1971. Coll. No. 014323

The Guatemalan plants are indistinguishable from those I have seen from Europe, including the production of numerous subglobose propagula in the leaf axils. The gametophytes average 4-5 mm high. Setae are 3-4 cm long with the capsules ranging in length from 2.8-3 mm. The neck of the capsule is distinct and slightly bulging-mamillose. The urn is smooth.

I am indebted to Dr. A.J. Sharp, Department of Botany, University of Tennessee, who has examined this collection and concurs in the identification.

Literature Cited

- Bartram, E.B. 1949. Mosses of Guatemala. Fieldiana 25:1-442.
Crum, Howard and Norton G. Miller. 1967. Three propaguliferous
Pohlias from Michigan. The Bryol. 70(1):118-119.

SEVEN UNDESCRIBED SUBSPECIFIC TAXA IN THE ERIOCAULACEAE AND
VERBENACEAE

Harold N. Moldenke

CARYOPTERIS INCANA f. *MACROPHYLLA* Moldenke, f. nov.

Haec forma a forma typica speciei foliis plerumque usque ad 11.5 cm. longis 4.5—5 cm. latis recedit.

This form differs from the typical form of the species in having the main leaves on flowering branches with petioles 2.5—3 cm. long and leaf-blades 8.5—9 cm. long and 4.5—5 cm. wide.

The type of the form was collected by an unknown collector somewhere in Japan on September 20, 1910, and is sheet number 1178283 in the United States National Herbarium at Washington.

CARYOPTERIS INCANA var. *SZECHUANENSIS* Moldenke, var. nov.

Haec varietas a forma typica speciei petiolis uniforme ca. 4 mm. longis et laminis foliorum uniforme 2.5—3 cm. longis 1—1.5 cm. latis regulariter grosse antrorse incisus et reticulo venarum venularumque supra arcte impresso recedit.

This variety differs from the typical form of the species in having its branches uniformly foliose, the internodes about 2 cm. long, the petioles uniformly about 4 mm. long, and the leaf-blades remarkably uniform, lanceolate-ovate, 2.5—3 cm. long, 1—1.5 cm. wide, regularly incised-dentate along practically the whole margins, the incisions antrorse, 2—3 mm. long, obliquely broad-based, bluntly subacute, revolute-margined, and the very abundant and fine vein- and veinlet-reticulation conspicuously and beautifully impressed on the upper surface.

The type of this variety was collected by Ernest Henry Wilson (no. 2221) somewhere in western Szechuan, China, in August, 1908, and is deposited in the United States National Herbarium at Washington.

CARYOPTERIS ODORATA var. *INTEGRIFOLIA* Moldenke, var. nov.

Haec varietas a forma typica speciei recedit foliis parvioribus plerumque 3—4.5 cm. longis 1—2 cm. latis integris subtus densiore persistenteque pubescentibus et inflorescentiis in axillis superioribus terminalibusque dense congestis.

This variety differs from the typical form of the species in having its leaves smaller, mostly only 3—4.5 cm. long and 1—2 cm. wide during anthesis, usually entire-margined, and mostly more densely and persistently pubescent beneath and the inflorescence densely congested in all the upper leaf-axils as well as terminal on stems and branches.

The type of the variety was collected by Walter Koelz (no. 4399) at Bhadwar, Kangra, Punjab, India, at an altitude of 2000 feet, on May 5, 1933, and is deposited in the United States National Herbarium at Washington.

CORNUTIA PYRAMIDATA var. *ISTHMICA* f. *ALBIDA* Moldenke, f. nov.

Haec forma a forma typica varietatis corollis albidis et laminis foliorum ultra medium serrulatis recedit.

This form differs from the typical form of the variety in having whitish corollas and the leaf-blades serrulate above the middle.

The type of the form was collected by Rolando Tun Ortiz (no. 2106) in a high forest at Santa Elena on the west side of the highway to Dolores at km. 70, El Petén, Guatemala, on November 20, 1971, and is deposited in the Britton Herbarium at the New York Botanical Garden. The collector describes the plant as a shrub 3 m. tall, the trunk 20 cm. in diameter, and the corollas "blanca amarillenta".

DURANTA MUTISII f. *SERRULATA* Moldenke, f. nov.

Haec forma a forma typica speciei laminis foliorum margine minute obscureque serrulatis recedit.

This form differs from the typical form of the species in having the margins of its leaf-blades minutely and obscurely serrulate.

The type of the form was collected by Antonio Allart (no. 325) at Colonia Tovar, Aragua, Venezuela, at an altitude of 1800 to 2000 meters, in December, 1924, and is deposited in the Britton Herbarium at the New York Botanical Garden.

LANTANA MINASSENSIS var. *HISPIDA* Moldenke, var. nov.

Haec varietas a forma typica speciei ramulis plusminus dense albido-hispidis recedit.

This variety differs from the typical form of the species in having the branchlets more or less densely hispidulous with long, white, often capitate hairs standing at right angles to the otherwise densely short-pubescent branchlets.

The type of the variety was collected by A. Krapovickas, C. L. Cristóbal, M. M. Arbo, V. Maruñak, R. I. Maruñak, and J. Irigoyen (no. 17030) on the high part of the barranca of the Río Uruguay, at the edge of a woods, Colonia Garabi, Dept. Santo Tomás, Corrientes, Argentina, on December 3, 1970, and is deposited in my personal herbarium at Plainfield, New Jersey. The collectors describe the plant as a shrub 1.8 m. tall.

LEIOTHRIX HIRSUTA f. *VIVIPARA* Moldenke, f. nov.

Haec forma a forma typica speciei capitulis viviparo-proliferis recedit.

This form differs from the typical form of the species in having some or most of its flower-heads viviparously proliferating into clusters of miniature leaves.

The type of the form was collected by H. Strang and A. Castellanos (no. 26306) at Pedra Itaúna "na rodoc. BR-6", Restinga de Sernambetiba, Guanabara, Brazil, on March 12, 1967, and is deposited in my personal herbarium at Plainfield, New Jersey.

VARIEGATA ONCIDIUMS

W.W.G. Moir

In *Phytologia* Vol. 15. No. 1 the author and A.D. Hawkes had an article on "Studies in the equitant oncidiums". In Vol. 17. No. 6 of the same publication the author had two more articles. In the article in Vol. 15 page 10 and 11 is described a var. majus to Onc. leiboldii. This has proven to be a natural hybrid between Onc. leiboldii Rchb.f. and Onc. variegatum (SW.) SW. and in this article it is named Onc. x cubense, for it arrived in Hawaii before 1950 as a plant from Cuba without place of origin.

In the American Orchid Soc. Bull. 36:220, 1967 Withner described Onc. osmentii. Just as in the case of Onc. x cubense I have proved by actual breeding that this plant is a natural hybrid between Onc. haitiense Leonard & Ames and Onc. quadrilobum C. Schweinfurth so this name will be recorded henceforth as Onc. x osmentii (Withner) Moir 1972.

Mr. William Osment of 2435 Cleveland St., Hollywood, Florida has, in the last couple of years, found some interesting new plants while studying these Variegata oncidiums in the Dominican Republic. He found, along with Miss Ann Hadder, a new natural hybrid between Onc. variegatum (SW.) SW. and Onc. haitiense Leonard & Ames at Sabana Alta in the western part of the Republic. This is described as Onc. x ann-hadderiae. In the northwest part of the Republic, Osment found a form of Onc. desertorum that has a red lip and yellow sepals and petals. This is described herein as Onc. desertorum var. aureorubrum. This could possibly be a natural hybrid between Onc. desertorum and Onc. desertorum var. alborubrum.

In Haiti in 1955 the author collected plants of Onc. velutinum (Ldl.) when not in flower. When flowering these in Hawaii one plant turned out to be different. It looked like a hybrid of Onc. velutinum (Ldl.) and Onc. variegatum (SW.) SW. A year ago the man made hybrid of these two species was flowered. It turned out to be identical to the plant from Haiti and so the Haiti plant has been named Onc. x varvelum. The all purple form of Onc. velutinum is to be found in both the D.R. and Haiti on the southwestern portion of Hispaniola. The flower is larger and its crest has three large horns instead of 5 of the species. This is now designated var. purpureum.

A book has been published in 1970 by the author and his wife, May A. Moir, on "Variegata Oncidiums" and pictures of them given along with the prominent points of their characteristics as to location, growth, flowers, environment, and

further comments. With those described here there now totals 30 species, 8 varieties and 11 natural hybrids. Onc. guibertianum (A.Rich) has proved to be Onc. lemonianum (Lindl.) so the latter name should now be used. Onc. tenellum listed by Garay on page 450 of "A Reappraisal of the Genus Oncidium SW." is not to be found in Guyana and its description reads like Onc. variegatum (SW.) SW. and is not counted among the 30 species.

There still exists in the Bahamas three types of plants that have different colors of flowers that are different to Onc. lucayanum Nash, Onc. bahamense Nash, Onc. sylvestre Ldl. and Onc. urophyllum Lodd. Plants with purple and white flowers are three times larger than Onc. lucayanum and have up to 50 flowers per spike. The yellow flowered form and the orange red form are plants of intermediate size and have well spaced flowers but fewer. A form of urophyllum was found in Eleuthera, Bahamas by John Hall III but it has much longer rhizomes than the type form in Antigua. The form of Onc. bahamense Nash (not Onc. variegatum (SW.) SW.) in west Palm Beach area in Florida is also much more vigorous than the form from Andros, Bahamas, even after 15 years of growing side by side in Hawaii.

Many years ago I went to the Dominican Republic and while dollecting in the area east of Santiago Rodriguez some plants were collected not in flower. Later one bloomed that was different to any I had seen before. Later Osment sent me in 1971 a plant that has flowered in May 1972 that has the same flower. I thought these had Onc. variegatum in them but on closer examination it is not so. I know how the hybrid would be if it was a natural cross of Onc. variegatum with the yellow flowered species of the area: desertorum, quadrilobum and haitiense so I have described it as a new species named it after Dr. Jose de J. Jimenez of Santiago de los Caballeros, a medical doctor with a hobby of botany and author of Supplement No. 1 of Moscosco's Flora Domingensis..

Herbarium specimens of the new additions will be sent to Ames Herbarium, Harvard University, Cambridge, Mass. For Onc. x cubense, a new label for the specimen Onc. leiboldii var. majus will be sent instead of a new specimen. All specimens have been flowered in Hawaii and checked with other species. Natural hybrids have been checked with man made plants of the same crosses. No specimen will be sent of Onc. velutinum var. purpureum but a photograph will suffice.

ONCIDIUM JIMENEZII, Moir, sp. nov.

Planta grandis. Pseudobulbi nulli. Folia ad 5 sessilis, lanceolata, acuta, supra profunde canaliculata, crasse coriacea, margine minute denticulata, ad 6 cm. longa, ad 1 cm. lata; viridis. Scapus racemosa, post paniculata, pauci- ad pluriflora, 15 ad 25 cm. longa; bractae lanceolata, tenui-membranaceae, ad 1 cm. longa; pedicelli cum ovariis 2 cm. longi. Sepalum dorsale spatulatum, concavum, rubiginosus; laterali synsepalum post labellum, linearis, 2 apicem; 1 cm. longum, 2 mm. latum. Petala 1.2 cm. longa, 8 mm. lata, obtusa, prima rubiginosa, citrina cum rubiginosa maculata. Labelli lobi laterales 8 mm. longa, 4 mm. lata, oblongive, apice rotundati; isthmi augusti; lobus intermedius reniformis, apice unguis, laviter crenulatus, 2 cm. latus, totum labellum ad 1.5 cm. longum, omnia lutea; cristis labelli biseriata, tubercula 3 in serie, toti 6, lutei. Gynostemii alae magnae, ovalis, acutae, citrinae. Fl. a maius.

Plant large, no pseudobulb. Leaves to 5, lanceolate, pointed, above deeply grooved, fat and coarse, minute teeth on margin, to 6 cm. long, to 1 cm. broad. Scape raceme, later panicle, few to many flowered, 15 to 25 cm. long; bracts lanceolate, membranous, to 1 cm. long; pedicel plus ovary 2 cm. long. Dorsal sepal spatulate, concave, brown red; laterals synsepal behind labellum, linear with 2 points, 1 cm. long, 2 mm. broad, spotted with brown red. Petal 1.2 cm. long, 8 mm. broad, obtuse, first brown red then pale yellow with brown red spots near edge. Labellum side lobes 7 mm. long, 4 mm. broad, oblong, rounded end; narrow isthmus; middle lobe reniform, full, apice clawed, large indent, edge crenulate, 2 cm. broad, yellow, total labellum to 1.5 cm. long; crest in two series of 3 each, 6 in total, forward pointing, upper outer ones slightly grooved. Wings on column large, bottom rounded, upper end pointed. Flowers in May.

Dominican Republic east of Santiago Rodriguez in shrubbery. Collected by Moir in 1955. Recollected by William Osment in 1969.

ONC. VELUTINUM var. PURPUREUM Moir, var. nov.

Differt a forma typica flora amplius. Flora color purpura; cristis 3 partis in vicam 5.

Plant same as species but flower larger and of purple color with darker purple colors near crest, upper lobes and at base of sepals and petals, crest, upper lobes and at base of sepals and petals. Crest has 3 instead of 5 horns that is the two, one on each side of the large horn of the lower section of the crest, are not present so makes lower, large horn more prominent.

Hispaniola SW. Collected at roadside on citrus trees along with species and n.h. Onc. x varvelum 1955. Above Petionville, Haiti.

ONCIDIUM DESERTORUM var. AUREORUBRUM, Moir var. nov.

Planta similis var. alborubrum; petala et sepala lutea in viceum album.

Strong plant, much greener than type. Sepals and petals deep yellow and red lip, so very much like var. alborubrum except for sepals and petals color.

Dominican Republic - near Santiago Rodriguez. Collected by William Osment. Flowered in Hawaii.

ONCIDIUM x ANN-HADDERIAE, Moir, nat. hybr. nov.

(Onc. variegatum (SW.) SW. x Onc. haitiense Leonard and Ames) Habitu inter parentiis intermedium. Flora magna.

Pseudobulb not visable, growth compact to slightly rhizomatous. Leaves 4 cm. long and 1 cm. broad, olive green, dull point, upper edge grooved, 5 to 6 leaves. Scape raceme then later branched. Dorsal sepal 6 mm. long, 2 mm. broad, concave, brown bars on yellow; lateral sepals joined to near end, concave, brown, 1 cm. long, 4 mm. broad. Petals 1.2 cm. long by 5 mm. wide, brown bars part way on yellow, pointed petals turned upward and slightly reflexed. Lip 1.7 cm. long 1.9 cm. broad, full, reniform lower lobe, light yellow, slightly undulating edge; lateral lobes 5 mm. long by 2 mm wide, turned up. crest large, 6 parts 5 nearly equal in size and all but the middle one of the lower three are turned down, but the middle one of the upper three is a pearlike projection. Wings on column large, rounded base and pointed top. Flowers in May.

Dominican Republic, Sabana Alta near San Juan collected by Ann Hadder and William Osment of Hollywood, Florida. Flowered in Hollywood, Florida and Honolulu.

ONCIDIUM x CUBENSE Moir, not. hybr. nov.

(Onc. variegatum (SW.) SW. x Onc. leiboldii Rchb.f.)

Habitu inter parentiis intermedium, excepto folii longiore. Rhizoma brevis,

Pseudbulb non visibile, plant on 3 to 4 cm. rhizome, numerous roots. Leaves 6 to 7 cm. long. 1 cm. broad, upper side longer and curved to a sharp point, large groove. Scape short and many flowered, bracts small and pointed. Dorsal sepal 1 cm. long by 3 mm. broad, brown bars on white,

concave, erect; lateral sepals joined, brown, concave, two pointed. Petals 1.2 cm. by 5 mm., undulated, white, with dark brown bars to 3/4 of way from base. Lip 2 cm. x 2 cm. white with dark brown bars and spots to mask around crest; lateral lobes medium sized turned up and rounded; isthmus about 5 mm; lower lobe reniform and full. Wings on column large like variegatum. Stronger grower than either parent and floriferous.

Cuba, exact spot unknown. Received in Honolulu prior to 1950. Flowered in Honolulu. Specimen already at Ames Herbarium as Onc. leiboldii var. majus. Proved by making the cross.

ONCIDUM x VARVELUM Moir, nat. hybr. nov.

(Onc. variegatum (SW.) SW. x Onc. velutinum Ldl.)

Habitu inter parentis intermedium.

Pseudobulbs not visible. Growth rhizomatous as both parents but more lax compared to velutinum, rhizome 10 cm., wiry. Leaves to 5 or 6 in number curved and grooved on upper edge, green, serrated lightly. Scape a raceme at first then branched later, long, floriferous. Dorsal sepal 8 mm. long x 2 mm. broad, light lavender with brown bars, concave; lateral sepals jointed together but 2 points, concave, brown. Petals 1 cm. long x 7 mm. broad at middle, with brown bars part way, white to pale lavender, and undulated, dull point, turned inward and upward. Lip 1.7 cm. long to 1.8 mm. turned up and rounded ends as in velutinum; mask around crest brown to dotted with brown; crest 6 parts, upper two large and straight sideways with groove, little pearl like projection in between large ones, lower part of crest has 1 large part turned up and one little one on each side. Wings on column are large, lavender, lower end rounded, upper end pointed.

Haiti about 2500 ft. elevation on citrus trees at road side, above Petionville. Flowered in Honolulu.

ADDITIONAL NOTES ON THE GENUS VERBENA. XIV

Harold N. Moldenke

VERBENA OFFICINALIS L.

Additional bibliography: Moldenke, *Phytologia* 23: 377--389. 1972.

Coon (1963) tells us also that "Pliny said 'if the dining chamber be sprinkled in water in which the herb Verbena has been steeped, the guests will be merrier'. Such a story led to a belief in its efficacy as a cure against the plague, and as a remedy for almost anything. It even had supposed supernatural powers. Several Welsh names have meanings such as 'devil's hate' and 'enchantment herb'."

Fior (1969) reports that "Gli antichi attribuirono a questa p. proprietà meravigliose, la impiegarono per pulire gli altari prima dei sacrifici e par intessere corone agli eroi ai poeti." He affirms that the name "verbena" was used by Virgil, which is correct.

Bertolini (1844), as is to be expected, concentrates on the Roman history of the plant: "Olim laudata apud medicos ob vim adstringentem, vulnerariam, nunc exoleta. Veteres superstitiose Verbenas adhibebant: 'Siquidem auctores imperii Romani, conditorumque immensum quiddam et hinc sumpserunt, quoniam non aliunde sagmina in remediis publicis fuere, et in sacris, legationibusque Verbenae. Certe utroque nomine idem significatur, hoc est gramen ex arce cum sua terra evulsam, ac semper et legati cum ad hostes, clarigatumque mitterentur, idest res raptas clare repetitum, unus utique Verbenarius vocabatur.' Flin. Nat. hist. lib. 22, cap. 2. [58--79 A.D.] Pari ratione utebantur Verbenis in sacris magicis:

"Effer aquam, et molli cinge haec altaria vitta,

Verbenasque adole pingues, et mascula thura

Virg. Eccl. 8. v. 64.65 [37 B.C.]

Sacerdotes eisdem coronabantur:

".....alii fontem, ignemque ferebant

Velati lino, et verbenae tempore cincti

Virg. Aeneid. lib. 12, v. 119.120 [19 B.C.]

Imprimis vero aediculae compitales verbenis ornabantur:

"Flore sacella tego, verbenis compita velo,

Et crepat ad veteres herba sabina focos

Prop. Eleg. lib. 4. eleg. 3. v. 57.58." [26 B.C.]

Folkard (1884) gives another full account of this fascinating plant's history, saying "The Vervain, or Verbena, has from time immemorial been the symbol of enchantment, and the most ancient nations employed this plant in their divinations, sacrificial and other rites, and in incantations. It bore the names of Tears of Isis, Tears of Juno, Mercury's Blood, Persephonion, Demetria, and Cerealis. The Magi of the ancient Elamites or Persians made great use of the Vervain in the worship of the Sun, always carrying branches of it in their hands when they approached the altar. The

magicians also employed the mystic herb in their pretended divinations, and affirmed that, by smearing the body over with the juice of this plant, the person would obtain whatever he set his heart upon, and be able to reconcile the most inveterate enemies, make friends with whom he pleased, and gain the affection, and cure the disease of whom he listed. When they cut Vervain, it was always at a time when both the sun and moon were invisible, and they poured honey and honeycomb on the earth, as an atonement for robbing it of so precious a herb. -- The Greeks called it the Sacred Herb, and it was with this plant only that they cleansed the festival-table of Jupiter before any great solemnity took place; and hence, according to Pliny, the name of Verbena is derived. It was, also, one of the plants which was dedicated to Venus. Venus Victrix wore a crown of Myrtle interwoven with Vervain. -- With the Romans, the Vervain was a plant of good omen, and considered strictly sacred: --

'Bring your garlands, and with reverence place
The Vervain on the altar.'

They employed it in their religious rites, swept their temples and cleansed their altars with it, and sprinkled holy water with its branches. They also purified their houses with it, to keep off evil spirits; and in order to make themselves invulnerable, they carried about their persons a blade of Grass and some Vervain. Their ambassadors, or heralds-at-arms, wore crowns of Vervain when they went to offer terms of reconciliation, or to give defiance to their enemies, a custom thus noted by Drayton: --

'A wreath of Vervain heralds wear,
Amongst our garlands named;
Being sent that dreadful news to bear,
Offensive war proclaimed.'

Virgil mentions Vervain as one of the charms used by an enchantress: --

'Bring running water, bind those altars round
With fillets, and with Vervain strew the ground.'

The Druids, both in Gaul and in Britain, regarded the Vervain with the same veneration as the Hindus do the Kusa or Tulasi, and, like the Magi of the East, they offered sacrifices to the earth before they cut this plant. This ceremony took place in Spring, at about the rising of the Great Dog Star, but so that neither sun nor moon would be at that time above the earth to see the sacred herb cut. It was to be dug up with an iron instrument, and to be waved aloft in the air, the left hand only being used. It was also ordained by the Druidical priests, for those who collected it, 'that before they take up the herb, they bestow upon the ground where it groweth honey with the combs, in token of satisfaction and amends for the wrong and violence done in depriving her of so holy a herb. The leaves, stalks, and flowers were dried separately in the shade, and were used for the bites of serpents infused in wine. Another account states that the Druidesses held Vervain in as great veneration as the Druids did the Mistletoe. They were never permitted to touch it. It was to be gathered at midnight, at the full of the moon, in this manner: -- a long string with a loop in

it was thrown over the Vervain-plant, and the other end fastened to the left great toe of a young virgin, who was then to drag at it till she had uprooted it. The eldest Druidess then received it in a cloth, and carried it home, to use it for medicinal purposes and offerings to their gods. In the Druidic procession, to the gathering of the Mistletoe, the white-clad herald carried a branch of Vervain in his hand, encircled by two serpents. The priests, when performing their daily functions of feeding the never-dying fires in the Druidic temples, prayed for the space of an hour, holding branches of Vervain in their hands. Pliny tells us that the Druids made use of it in casting lots, as well as in drawing omens and in other pretended magical arts; he also says that if the hall or dining chamber be sprinkled with water wherein Vervain lay steeped, all that sat at the table should be 'very pleasant and make merry more jocundly'.

'Lift up your boughs of Vervain blue,
Dipt in cold September dew;
And dash the moisture, chaste and clear,
O'er the ground and through the air.' — Mason

'In mediaeval days, the sacred character of Vervain was still maintained, and the plant was greatly prized, and used in compounding charms and love-philtres. Known in our country as Holy Herb and Simpler's Joy, it was credited with great medicinal virtues.

'Black melancholy rusts, that fed despair
Through wounds' long rage, with sprinkled Vervain cleared.'
Davenant.

Its juice was given as a cure for the plague, and the plant was prescribed as a remedy in some thirty different maladies, and was suspended round the neck as an amulet. Gerarde, however, tells us that 'the devil did reveal it as a secret and divine medicine'; and R. Turner writes (1687): — 'It is said to be used by witches to do mischief, and so may all other herbs if by wicked astrologers used to accomplish their wretched ends'. But notwithstanding that it was used by witches and wizards in their incantations and spells, and was in fact called the Enchanter's Plant, Vervain was considered to possess the power of combating witches; thus Aubrey says: —

'.....Vervain and Dill
Hinder witches from their will.'

and Michael Drayton writes: —

'Here holy Vervayne, and here Dill,
'Gainst witchcraft much awayling.'

and again —

'The Nightshade strews to work him ill,
Therewith the Vervain and the Dill
That hindreth witches of their will.'

On the Even of St. John (June 23rd), Vervain was for a long time associated with the observances of Midsummer Eve. Thus we read in 'Ye Popish Kingdome': —

'Then doth ye joyfull feast of John ye Baptist take his turne

When bonfires great with loftie flame in every towne doe burne,
And young men round about with maides doe dance in every
streete,
With garlands wrought of Mother-wort, or else with Vervain
sweete.'

J. White, Minister of God's Word, writes in 1624: — 'Many also use to weare Vervein against blasts; and when they gather it for this purpose firste they crosse the herb with their hand, and then they blesse it thus: --

'Hallowed be thou, Vervein,
As thou growest on the ground,
For on the Mount of Calvary
There thou wast first found
Thou healedst our Saviour Jesus Christ,
And staunchedst his bleeding wound,
In the name of the Father, the Son, and the Holy Ghost,
I take thee from the ground.'

In many rural districts, Vervain is still regarded as a plant possessing magical virtues as a love philtre. It has the reputation of securing affection from those who take it to those who administer it. The gun-flint boiled in Vervain and Rue ensures the shot taking effect. The root of Vervain tied with a white satin ribbon round the neck acts as a charm against ague. Vervain and baked toads, worn in silken bags around the neck, are a cure for the evil. — In the northern provinces of France, the peasants still continue to gather Vervain under the different phases of the moon, using certain mysterious ejaculations known only to themselves whilst in the act of collecting the mystic herb, by whose assistant they hope to effect cures, and charm both the flocks and the rustic beauties of the village. — The Germans present a hat of Vervain to the newly-married bride, as though placing her under the protection of Venus Victrix, the patroness of the plant. — Gerarde tells us that in his time it was called 'Holie Herbe, Juno's Teares, Mercurie's Moist Blood, and Pigeon's Grass, or Columbine, because pigeons are delighted to be amongst it, as also to eate thereof.' — Astrologers place Vervain under the dominion of Venus."

This same exhaustive researcher in the field of folklore and botanical history tells us that the bridal wreaths of the Romans were usually composed of vervain plucked by the bride herself. In Brittany the vervain is known as "herb-of-the-cross". The populace of Madrid was long accustomed, on St. John's Eve, to wander about the fields in search of vervain, from a superstitious notion that this plant possesses preternatural powers when gathered at 12 o'clock on St. John's Eve. "The divining Gall-apple of the Oak, the mystic Mistletoe, the Savin, the Moonwort, the Vervain, and the St. John's Wort are considered magical, and therefore form part of the witches' pharmacopoeia — to be produced as occasion may require, and their juices infused in the hell-broths, philtres, potions, and baleful draughts prepared for their enemies. -- Vervain and St. John's Wort, carried about the person, will prove a sure preservation against the wiles of Satan and the

machinations and sorcery of witches:

'Gin you would be leman of mine

Lay aside the St. John's Wort and the Vervain.'

The Mistletoe, in addition to its miraculous medicinal virtues, possesses the power of opening all locks; and a similar property is by some ascribed to Artemisia, the Mandrake, and the Vervain."

Benchley (1970) says "Supposedly sophisticated Europeans still splash themselves with exotic oils and drink doses of vervain" as an aphrodisiac.

Lonicer (1679) speaks in old German of the medicinal virtues of Verbena officinalis in his time: "Seyn gut zu den feuchten oder fliessenden Wunden / oder alten Schäden. Die Wurtzeln seyn gut / mit Wein getruncken / für die Geelsucht. Eisenkraut heilet allerley innerliche Gebrechen / als die verstopfte Leber / Miltz und Nieren / in Wein gesotten / und darüber getruncken. Es hilft auch also getruncken / für das schwere Athemen / oder Keichen. Eisenkraut gestossen / als ein Pflaster auf die Wunden gelegt / heilet und trücket sie geschwind. Eisenkraut safft mit Wein getruncken / benimmt des Gifft im Leib. Die Blätter und Wurtzel in Wein gelegt / den Wein getruncken / benimmt das viertägige Fieber. Etliche meinen / zum dreytägigen Fieber soll man nemmen drey Blätter / und zum viertägigen vier Blätter und vier Wurtzeln. Die Blätter ein Quintlin in Wein gethan / den also vier Tag lassen stehen / und darnach im Mund gehalten / heilet die Geschwer darinn. Eisenkraut mit Wasser gesotten / und genützt / reiniget den Frauer ihre Mutter / und bringt ihnen ihre Zeit. Oder siede das Kraut samt der Wurtzel in Wein / und trincks. Der Saame mit Fenchel-safft vermischt / und in die Augen gelassen / reiniget sie und machet klar Gesicht. Eisenkraut ist gut zur Leber / und zum erhaben und geschwellenen Miltz / wie gleichfalls zur siechen Lungen. Eisenkraut mit samt der Wurtzel gestossen / darvon getruncken / oder die Wurtzel pulverisiert und getruncken / vertreibt den Stein. Die Blätter von Eisenkraut in Essig genetzt oder gestossen / und übers heilig Feuer gelegt / kühlet und löschet den Brand.... Das Kraut und Wurtzel in Wein gesotten / den Mund damit gespfflet oder geschwencket / ist gur für das effen und faule Zahlfleisch. Eisenkraut mit Honig vermischt / zeucht die Wunden zusammen. Das Kraut mit altem schweinen Schmaltz zerstoßen / und übergelegt / leget nider der Frauen Geschwulst an heimlichen Orten / zusamt den Schmertzen.....Eisenkraut soll um S. Johannis Tag / mit aller Substantz gehackt und gebrannt werden. Eisenkrautwasser Morgens und Abends / jedesmal drey Loth / sechs oder acht Tag nacheinander getruncken / vertreibt die Geelsucht / ist gut für Gifft / dreytägig oder viertägig Fieber / vertreibt die Würm im Leib / alle Morgen nüchtern getruncken. Hat die Krafft wie Gamanderlin. Das Wasser wie obsteht getruncken / ist gut zur engen Brust / und für das schwere Athmen / Geschwer der Lungen / Schwindsucht der Lungen / stärcket die Leber / und bringt dem Menschen gute Farbe. Das Wasser ist auch gut getruncken für Schmertzen desz Magens / für Verstopffung der Leber und Miltzes / auch Lenden und Blasenwehe. Mehr für Verstopffung desz Eingeweids / Magens und Bauchs / auch zur Geelsucht. Das Wasser reiniget die Nieren und Blasen vom

Gries und zertheilet den Stein in der Blasen. Getruncken dienets auch zu den Blättern im Leib / Blutharnen und Grimmen. Eisenkrautwasser ist das beste Wasser für Hauptwehe und Schusz desz Haupts / die Stirn und Schläff oft damit bestrichen / und mit Tüchlin übergelegt / ist fast gut für langwirige Krankheiten / da man nicht weis wovon sie entspringen. Das Wasser ist gut für alle Nebel und Geschwer der Augen / stärckt das blöde Gesicht / bringt den Schein und Glast wider / alle Tag einmal oder zwey darein gethan / und darun gestrichen / gerieben / und Tüchlin darüßer gelegt. Das Wasser ist auch gut für das Essen und Lücher an der Frauen Gemächt / dieselbige Morgens und Abends damit gewaschen / auch Tüchlin darinn genetzt und übergelegt. Disz Wasser vertreibt auch die Feigwartzen / damit gewaschen."

Hubert (1921) discusses the anatomy, chemical composition, and uses of Verbena officinalis. Crevost & Pételot (1934) tell us that in Indochina "La plante est considérée pas les indigènes comme amère et aromatique. D'après le R. P. Robert, elle passe pour régulariser les menstrues et pour guérir la 'boule hystérique'. On en fait, pour cela, une purée que l'on fait cuire et qui se prend avec de l'alcool de riz."

Manning (1956) says that infusions of this plant are used in reducing temperature in fevers and in the treatment of nervous disorders. Ward (1967) gives V. hastata L. as a synonym, which, of course, is ridiculous -- the two species cannot possibly be confused by anyone who has ever seen them both! He says that the plant is very bitter to taste, with a slight aromatic odor when rubbed, and is a nervine, tonic, emetic, and sudorific in medical usage. He notes that Coffin, writing 90 years ago, said "As an emetic it ranks next to lobelia; it is also one of the strongest sweating medicines in nature. It is good for colds, coughs and pain in the head, and some years ago was highly esteemed as a remedy for consumption. As an emetic it supercedes the use of antimony and ipecacuanha to both of which it is superior, since it not only produces all the good effects ascribed to the others, but it operates without any of the dangerous consequences that ever attach the use of antimonial preparations and cramps, and even death have been known to follow their use....Vervain will relieve and cure those complaints in children which generally accompany teething; it likewise destroys worms, administered as a tea it powerfully assists the pains of labour; as a diuretic it increases the urinary discharge." Ward further states that the ounce-to-pint infusion is now used and taken in wineglass doses, and, as a nervine, Skullcap and Valerian are usually added.

Scopoli (1777) poses the question regarding the uses of Verbena officinalis: "Verbenam officinalem ad Cephalaeam etiam inveteratam commendat Haenivs?" Smith informs us that even as far away as the Ryukyu Islands this plant is regarded as medicinal, being used to bathe babies; it is found abundantly there in sandy and red earth. Airy Shaw (1966) points out that it was formerly held in great repute in Europe as a remedy in eye diseases, its bright corolla, like that of Euphrasia, being supposed, under the

old Doctrine of Signatures, to indicate its virtue in that direction. Rageau (1957) says that in New Caledonia it is regarded as "amère, âpre et aromatique. La plante entière est utilisée comme vulnéraire en médecine populaire française".

Lázaro e Ibiza (1921) asserts that the species is found throughout Spain, and there is regarded as "Es amarga y astringente, y fué usada como febrífuga, resolutive y vulneraria; los antiguos la consideraban como sagrada." Al-Rawi & Chakravarty (1964) assert that the plant contains tannic acid, invertin, saponin, verbenalin, verberin, and emulsin, and is used even now as a corroborant, nervine, antispasmodic, febrifuge, tonic, aphrodisiac, antiscorbutic, galactagogue, deterrent, emetic, sudorific, diuretic, and against whooping cough.

Alzate (1968) affirms that Verbena litoralis and V. hispida can be used as a substitute for V. officinalis where the latter is unavailable, and have the same properties: "Substituyen a la Verbena officinalis, común en Europa y se usan en decocciones o infusiones a dosis de 10 a 20 grms. por 200 de agua. Todos los médicos reconocen el gran valor de nuestras verbenas, para cortar las fiebres de origen gástrico y tifoidea, administrando la decocción en lavados y en forma de tisana. Reemplaza a la quinina. Los antiguos la consideraban como un remedio universal. Ahora como febrífugo, resolutive y vulnerario. Las hojas y sumidades bien machacadas suelen usarse en cataplasmas, como vulnerarias, y el zumo se usa en infusión contra los dolores de cabeza. La planta fresca machacada y aplicada sobre las sienes y frente, calma el dolor de cabeza. Hervida en agua aplicada sobre heridas sucias y de larga supuración. El jugo de la planta, usado en fricciones, cura la sarna. El zumo cura la diarrea, la bilis y voluptuosidad. Las hojas y ramas hervidas curan y resuelven los tumores internos (tomar copitas). Los romanos y griegos la llamaban planta VIRGEN y la usaban en cataplasmas de hojas machacadas sobre la vejiga para combatir los derrames seminales nocturnos."

Martinez (1969) informs us that in Mexico "El cocimiento de las inflorescencias se usa para fortalecer el pelo. También se usa el polvo contra la hidropesía y la infusión teiforme o el extracto contra las fiebres intermitentes (en Nay. [=Nayarit]). En Zitácuaro, Mich. [=Michoacán], usan el cocimiento de las flores 'contra la biliosidad'. El Prof. Pedro M. Rodríguez dice citando al Dr. Ricci, que es eficaz contra las fiebres. Se hace un cocimiento de 5 gramos de hojas en medio litro de agua hirviendo y se deja consumir hasta la mitad, se cuela y se toma en ayunos durante varios días. En Nayarit toman el cocimiento antes de cada comida contra la fiebre. En Teleoloapan, Gro. [=Guerrero], lo toman con igual objeto, pero le añaden hojas de fresno....la hojas majadas y aplicadas con aceite rosado o con enjundia de puerco, quita el mal de madre; y aplicándolas con vinagre apagan el fuego de San Antón y reprime las llagas corrompidas; mezcladas con miel sueldan las heridas; su bebida es contra tiricia (ictericia) y su cocimiento de sus hojas y raíces cura las hinchazones."

Gattinger (1894) asserts that in his time "The herb in flower" was used medicinally in Tennessee. Smith (1871) records the Chinese vernacular name "ma-pien-ts'au" for the plant, roughly translated as "horsewhip-plant". He affirms that the species is as common in China as it is in England and that it has received its common name from the long spiked inflorescence after the fall of the deciduous corollas. It is confused by the country folk with a species of Leonurus because of its similarly square stem. It is said to act on the blood, relieving congestions, obstructions, dropsical effusions, and haematocoeles. It is also credited with emmenagogue, anthelmintic, and antoscrobutic properties. The root is said to be astringent.

Ferrándiz (1967) notes that the "Planta muy conocida en Europa y cultivada en todos los jardines, vulgarmente se la denomina la 'Hierba de todos los males' y en verdad que tiene diversas aplicaciones. Hervida la planta en agua se aplica sobre heridas tórpidas de larga supuración. En forma de té, 15 gramos en un litro de agua, calma la fiebre y en gárgaras, alivia las afecciones de boca y garganta. La planta fresca machacada, aplicándola sobre las sienes, alivia el dolor de cabeza. El agua destilada de verbena fortifica el nervio óptico y el jugo de la planta en fricciones, cura la sarna. Buena especialmente para males de estómago, por excitar la digestión. Excelente febrífugo."

Verbena officinalis has been studied chemically very extensively. Cheymol (1937) reports the presence of stachyose in the roots and stems, as well as a verbenalloside which is apparently identical with cornine. Boudier (1907) isolated a verbenaline glucoside, while Asano and his associates (1942) found verbenalin yielding verbenalol and glucose. Verbenalin and a volatile oil were also reported by Breitwieser (1943), while Boudier (1908) isolated verbenalin, invertin, and emulsin. Huni and his associates (1966) report that V. officinalis specifically incorporates 2-¹⁴C labelled melvalonic acid in the formation of a glycone moiety of verbenalin. Echaust (1964) shows that the previously isolated verbenin and verbenalin are identical glycosides. He isolated, in addition, adenosin and β -carotene. Kariyone (1965) reports the same "adenosine" and β -carotene. Büchi & Manning (1960) provide a revised structural diagram for verbenalin. Reichert & Hoffmann (1935) proved that the glycoside, verbenalin, from Verbena officinalis, is identical with cornin from Benthamedia florida. Stecher (1968) gives its formula as $C_{17}H_{24}O_{10}$, the molecular weight as 388.36, C 52.57 percent, H 6.23 percent, and O 41.20 percent. Sakan & Abe (1968) show that verbenalol is the aglucone of verbenalin, a glycoside. The stereospecific synthesis of racemic verbenalol is presented as one of the most possible biogenetic precursors of the indole alkaloids and has a closely related structure to the components from Actinidia polygama and Boschniakia rossica.

Horodysky and his associates (1969) have also studied the biosynthesis of verbenalin (I) by the administration of acetate-1-¹⁴C, acetate-2-¹⁴C, mevalonate-2-¹⁴C, and geraniol-1-¹⁴C to

Verbena officinalis plants. When "I" which had been formed biosynthetically from mevalonate-2-¹⁴C was degraded, randomization of the label between carbon atoms 6 and 9 was not observed; carbon atom 6 retained most of the radioactivity in young and old plants. Randomization between carbon atoms 3 and 8 varied with the age of the plant. There was complete randomization in young plants, limited randomization in older plants, and essentially non-randomization in senile plants. The percentage of radioactivity in carbon atom 3 predominated over that in carbon atom 8 as the plant age increased. The ratio of radioactivity found in aglucone to that in glucose is considered to be metabolically significant.

Savage (1945) reports that under genus 35 VERBENA in the Linnean Herbarium in London, sheet 15 is labeled "15 officinalis [*spuria delet.*]" and has the accepted specific name in Linné's own handwriting.

Kalm (1770) affirms that he personally saw this species growing in only one place in North America, shown to him by Bartram "in a little plain near his house" near Philadelphia, Pennsylvania. It is assumed that the species had been introduced there from some seeds imported from England by Bartram.

Patzak & Rechinger (1967) give the overall distribution of the species as "Europa a Britannia et Dania meridiem versus, Regio Mediterranea, Africa borealis, Asia occidentalis et centralis usque ad montes Pamir-Alaj et Tien Shan et ad Himalayas occidentales; in America borealem et Africa australem et in regiones alias introducta."

Martin (1965) describes the species as "rather local" in England and Wales, while Paton (1968) says that in Cornwall and the Isles of Scilly it is "frequent on waste ground during summer, often with *Odonites verna*". Perring & Walters (1962) affirm that it is "casual only" in the northern parts of its range in the British Isles. Bowen (1968) reports it from Berkshire, England, as "native, [in] dry grasslands, roadsides, in decreasing small quantities". Druce (1897) referred to it as "Native, Viat-ical. Dry gravelly waysides, pastures, &c. Local. More frequent on calcareous soil in sunny situations [Berkshire, England]found in all the bordering counties.....Rather common in [Pang] district.....on chalk ballast near Reading". Dickinson (1851) says of it "Roadsides and waste ground....Common....Frequent.....Plentiful" in the Liverpool area.

Erfurth (1867) reports it from "Wegränder, Gebüsch, Zäune, unbebaute Ort in der Nähe der Städte u. Dörfer" in Germany. Wagner (1905) says that it is found "An Wegrändern, auf Schutthäufen und wüsten Plätzen in Mittel- und Südeuropa und Asien, nördlich bis Südschweden; im Gebiet häufig." Dietrich (1824) found it "In Dörfern, auf Schutthäufen, an Zäunen u.s.w. überall häufig. Blüht vom Juli bis September" in the Berlin area of Germany. He notes that "Officinell war Herba Verbenae. Die Wurzel giebt den Gurken einen angenehmen Geschmack". Martens & Kemmler (1882) found it "häufig an Wegen und auf Schutt, doch selten über 580 m. aufsteigend" in Württemberg. He also notes that the plant is men-

tioned by Pliny. Rechinger (1965) says of it "Gewöhl. E. -- Auf wüsten Plätzen....bei Bauernhäusern" in Austria. Ferguson & Natzio found it growing on a shingle beach backed by saltmarsh in Greece.

Montasir & Hassib (1956) state that Verbena officinalis is an important plant in oases and along the western Mediterranean parts of north Africa. Lazaro e Ibiza (1921) avers that it occurs in "Toda España". Sommer & Caruana Gatto (1915) say "Luoghi ruderali e lungo le vie. -- Malta e Gozo, abbastanza frequente!" In Italy Lanfrossi (1827) refers to it as "Comunissima; cresce ne' ruderi e lungo le strade e fiorece in Giugno, Luglio ed Adosta", while Tornabene (1891) found it "in ruderalis, ad vias et in hortis pedemontanae regionis Catania, Mascalucia, Nicolosi" in the Mount Etna region. He comments that "Olim apud medicos laudata ob vim adstringentem, vulnerariam. Nunc exoleta." Bertolini (1844) asserts that it is "Vulgaris in viis, ruderalis, collibus totius Italiae". In Belgium it was found by Sauzé & Maillart (1880) on the "Bords des chemins, lieux incultes", while both there and in Luxemburg Paque (1902) found it growing in "Lieux incultes, bords des chemins".

Catanzaro (1970) says that it inhabits "coltivati, incolti coltivabili e aridi, lungo le strade" in the Bivona region. Polunin (1969) reports that it is found in "Waste ground, waysides, screes.....Much of Eur. (except Is. [=Iceland]): introd. IRL. N. S. SF. [=Ireland, Norway, Sweden, Finland] Used in herbal remedies". Bouloumoy (1930) found it in "Lieux incultes; bords des chemins. Partout" in Lebanon and Syria. Harvey (1868) says "V. officinalis is common and seems to be truly wild" in South Africa. In his 1838 work he says "V. officinalis, or a species much resembling it, is common in the neighborhood of cultivation". In Lesotho it is said by Guillarmod (1971) to be "widespread in Southern Africa: often a weed of cultivated ground".

In Afghanistan it is described by Aitchison (1880) as "Common everywhere from Thal to the Kuram district up to 7000 feet; April to July". In Nepal, according to Banerjee & Shakya, it is "locally distributed"; in Bhutan, according to Deb, Gupta, & Malik (1968), it occurs in open situations; in Pakistan Hussain (1969) says it grows "in moist ground around ponds". Tingle (1967) reports it from Hongkong. Prain (1903) found it to be "A weed in waste places. In all the provinces" of Bengal. Clarke (1885) tells us that it is found in the "Himalaya, alt. 1--6000 ft., from Kashmir to Bhotan, frequent. Bengal Plain to the Sunderabunds, frequent. -- Distrib. Temperate and subtropical regions... T. Thomson collected at Kussoor, and Clarke at Chumba, a monstrous form with proliferous spikes, forming densely branched panicles, the lower flowers all pedicelled, variously altered and infertile" [this latter form is probably what is now known as Stachytarpheta jamaicensis f. monstrosa (Moldenke) Moldenke, due to a virus infection of Stachytarpheta jamaicensis (L.) Vahl, and has nothing to do with Verbena officinalis].

Balakrishnan (1964) records V. officinalis from Madras and

claims that it is the only wild species of the genus in India. Doubtless he means that it is the only native wild species, since at least three other species of Verbena have become naturalized there or have escaped from cultivation in some localities. Rau (1963) records it from altitudes of 1500--2500 meters in Uttar Pradesh, India; Maheshwari (1963) found it to be "Common along canal banks, near temporary puddles and stagnant water channels" in the Delhi area, where it flowers and fruits from April to October. Puri (1960) says that it occurs frequently in both burned and unburned areas in Indian forest quadrats and burned Pinus longifolia forests. Banerji (1965) speaks of it as only "occasional". Dattar & Majumdar (1966) assert that it is "distributed in the temperate regions". Kapoor (1968) refers to it as "occasional" in Kashmir, while the Banerjees (1969) record it from Bihar.

Ohwi (1965) speaks of it as a "Weed in waste grounds and along roadsides in lowlands; Honshu, Shikoku, Kyushu. -- A nearly cosmopolitan weed". Yamazaki (1966) refers to it as "Cosmopolitan in tropical and subtropical regions". Walker found it to be a weed in waste places on Okinawa.

Gilkey & Dennis (1967) tell us that "In ballast about Portland [Oregon] has been found Verbena officinalis L.....with...white (rarely purplish) flowers". Wherry (1967) reports it from Delaware County, Pennsylvania, while Domville & Dunbar (1970) refer to it as "adventive, rare in rich thickets, Summer" in Ulster County, New York. Carter & Jones (1968) report it from Forrest County, Mississippi, but I imagine that their record is based on a misidentification of V. halei Small. Gattinger (1894) found V. officinalis "Nearly everywhere about houses and settlements in sandy soil" in Tennessee. Sudworth, in 1890, found it abundant in the District of Columbia area. Tatnall (1946) records it from New Castle County, Delaware, Cecil, Sussex, and Worcester Counties, Maryland, and northern Accomac County, Virginia. Radford, Ahles, & Bell (1964) refer to it as infrequent in waste places in Hyde, Jones, and Mitchell Counties, North Carolina, and Aiken and Darlington Counties, South Carolina, flowering there from June to October.

Lems (1960) records V. officinalis from Gran Canaria and Tenerife in the Canary Islands; Pampanini (1930) records it from Cyrenaica, Hanson (1969) from Madeira, Porto Santo, Funchal, the Azores, and the Canary Islands, and Sykes (1970) from Niue island. Pedersen (1969) reviews its distribution in Denmark, as well as its extra-limital distribution in the rest of Europe, the Near East, and northwestern Africa. Voigt (1845) and Hara (1966) assert that it is cultivated in India. Masamune (1955) records it from Tanegashima, Yakushima, Takarazima, Amami-osima, Iheyazima, Isagaki, Iriomote, and Yonakuni islands. Perring & Walters (1962) record it from many localities in Eire, and Gupta (1967) from 2300 meters altitude in Uttar Pradesh, India. Macbride (1960) avers that it "probably" occurs in Peru, but he apparently saw no actual specimens to substantiate this supposition, nor to date have I.

Abrams (1951) records this plant from Amador County, California, and Portland, Oregon. Martinez (1969) reports it from "Hidalgo,

Valle de México, Estado de México, etc.", but I have personally seen it only from Nuevo León and suspect that the other references may apply to the very similar V. menthaefolia Benth., although V. officinalis is certainly to be expected in and about Mexico City and some of the other large cities of Mexico, especially ports.

Andersson (1859) records V. officinalis from the Galapagos Islands on the basis of a Charles Darwin collection from James Island, but gives in synonymy "V. caroliniana L. V. polystachya HBK. var. foliis incisis, laciniis grosse serratis (Hook., l. c. p. 195)". Examination of the Darwin specimen, however, has revealed that it is actually V. glabrata var. tenuispicata Moldenke. Hooker's plant and description apply to another Darwin collection from the same island, which is now the type collection of V. sedula var. darwinii Moldenke. The true V. officinalis L., therefore, is not known from the Galapagos Islands.

Bouchet & Andy (1966) report that where V. officinalis is regarded as an undesirable weed it may be controlled by use of the herbicides "dichlobenil" and "chlorthiamid", used at the rate of 3 kg. per hectare. It is not affected by buturon, parquat, diquat, 11561RP, nor any mixtures of these.

Hirata (1966) lists the following fungi as infesting the species: Erysiphe cichoracearum (in Germany, Russia, and Yugoslavia), Erysiphe polyphaga (in France, Switzerland, and Italy), Leveillula taurica (in Iran), Oidium verbenae (in Corsica, France, Greece, Israel, Japan, Lebanon, Romania, and Switzerland), and Oidium sp. (in Spain). Grove (1935) adds to this list Septoria verbenae Rob. & Desm.

I am very grateful to Dr. G. H. M. Lawrence and the Hunt Botanical Library in Pittsburgh, Pennsylvania, for enabling me to see a copy of the Macer (1477) work listed in the bibliography of this species. Dr. Lawrence points out that the pages were originally unnumbered and the Roman numerals now appearing on them were apparently added at a much later date. The volume is discussed in Hunt Bot. Cat. 1: 5 (1958) and the date of publication is given as 1477, rather than "1487" as given in Pritzel's "Thesaurus" or as "ca. 1490" as given elsewhere. I am indebted to Dr. J. J. Wurdack of the United States National Museum for the latter information. He reports that Agnes Arber also discusses this work in her book on herbals. This Macer reference is the earliest which I have as yet seen personally, although the bibliographic history of the species goes back to 37 B.C.

J. H. Moris, Flora Sardoia, vol. 3, also listed in the bibliography of V. officinalis in a previous installment of the present series of notes, is actually inscribed "1858-1859" on the title-page, but my good friend, Dr. W. T. Stearn, in a letter to me dated March 8, 1972, says "regarding the publication of Vol. 3 of Moris, Flora Sardoia, all I can say is that despite much search the only review found is one of 1860 covering the work as a whole. I can find no evidence that it was issued in parts and I should thus simply date vol. 3 as '1859'".

Mr. F. J. Anderson has kindly researched in the library of the New York Botanical Garden the date of publication of Georgi Jan's "Hortus Elenchus". He reports that this work is not treated in Pritzel nor in Stafleu, but according to the Catalogue of the British Museum Library (2: 924) the plants listed were collected in 1826 and the work published in 1831. He states, further, that the Matthioli, Disc. Valgr., references in the same bibliography of this species are apparently correct. "It is page 1107 of *Discorsi ne i sei libri....* published by Valgrisi in 1585 at Venice. No copy of that edition is in the N. Y. B. G. [=New York Botanical Garden library] but we have the edition of same title, printed by Valgrisi in 1568 and both the figure and the text relating to Verbenaca appear on page 1107 of that work." He also notes that "Johann Schröder's *Chymic. Dispens.* 1669 is actually his *Pharmacopeia Medico-Chymica* first published in 1641. Our library has the 1649 ed. and it mentions Verbena on pages 167-168. As to Orsin. Cap. Opusc. -- No trace of this author or title. It may be part of a serial journal." The last reference in this memorandum is to the "Orsin. in Cap. Opusc. p. 288" citation given by Bertolini (1844) which I have thus far been unable to verify.

It should be mentioned here that the two Maximowicz (1886) citations in the bibliography are often mis-dated "1887". The Robert Brown reprint (1821) is dated as 1821 by Pritzel, but as "1819" by Barnhart. The Tobe (1969) reference is erroneously given as page "159" in the index of the work, while the Farnsworth (1970) reference to item 15121 is erroneously listed in the index of the work as item "15105". The illustration in Hatton's work (1960) is said to have been taken from "M. (1565) 1052", but as yet I have been unable to trace this reference.

The Curtis (1775) publication is often cited as having been published in 1772, 1773, or 1777, but according to Stafleu, Tax. Lit. 90 (1967), plate 41 was originally published in May of 1775; 1777 is the title-page date for the whole volume, The Müller (1775) publication is often cited as "1777" also, but here, again, that is the volume title-page date; the title-page date for fascicle eleven, in which plate 628 appears, is "1775". The Bulliard work (1785) is often cited to vol. "3 & 4" or "5", but the volume appears to be unnumbered, at least in the library of the New York Botanical Garden.

The Sibthorp & Smith (1809) bibliographic reference is often cited as "1806", but pages 219--442 of this work were not issued until 1809. The Boswell Syme (1866) reference is sometimes cited as "1863", but volume 6 of this edition was actually not issued until 1866. The Druce publication (1898), although dated "1897" on its title-page, was actually not published until 1898 according to a writer in Journ. Bot. 36: 104 (1898). The Gerarde (1597) work is cited by some authors as "Ger. Em. 718".

It is also worth mentioning here that certain homonyms of names listed in the synonymy of V. officinalis do not apply to this plant at all: Verbena foemina Trag. is a synonym of Sisymbrium officinale L. in the Brassicaceae, Verbena foemina Brunf. is a

synonym of Senecio vulgaris L. in the Carduaceae, and Verbena recta sive mas Fuchs is a synonym of Sisymbrium officinale L. The Verbena sacra Gerarde, included in the synonymy of V. officinalis by me in a previous installment of this series of notes, appears actually to be synonymous with V. supina L., as an examination of the illustration given by Gerarde (1597, 1633) plainly shows.

Of considerable interest is the fact that Tournefort (1719) lists four "kinds" of Verbena: (1) Verbena communis coeruleo flore, Common vervain with blue flowers, (2) Verbena lusitanica, latifolia, procerior, Portuguese vervain, (3) Verbena tenuifolia, thin-leaved vervain, and (4) Verbena urticae-folia, canadensis, foliis incisus, flore majore, nettle-leaved vervain of Canada, with cut leaves, and a larger flower. All of these except the third have usually been relegated to the synonymy of V. officinalis — the third being regarded as V. supina L. -- but on this disposition of these names I have grave reservations. More study is required here.

Similarly, Haller (1768, p. 96) describes a variety "[♂] Foliis vix dissectis Hort. Florent. 98 [=Manetti, Virid. Florent. 98. 1751]". This is probably the same variety listed by Bertolini (1844) as "Eadem foliis non, vel parum dissectis". Haller (1768, p. 661) also lists a variety "^γ Folia variegato Breyn. Prodr. 2. 100". It is not clear to me if either of these varietal descriptions apply to any of the eleven subspecific taxa at present recognized in V. officinalis, but the former may be the same as var. latiloba Sennen.

The Bayliss BS.3045, distributed as V. officinalis, is actually V. brasiliensis Vell.; E. Contreras 5247 is V. carolina f. albiflora Moldenke; E. Hall 432, Edw. Palmer 1043, G. T. Robbins 2410 & 2486, F. H. Sargent 7745, K. E. Smith s.n. [Palestine, 4/21/35], Tharp s.n. [Austin, 5/2/35] & s.n. [Austin, 5/9/35], R. D. Thomas 2825, and Vollum s.n. [Fort Belknap, 1855] are all V. halei Small; E. Contreras 6152 is V. litoralis H.B.K.; Hodgkins s.n. [Herb. Bot. Div. D. S. I. R. 2052] is V. officinalis var. grandiflora Hausskn.; Healy 60/64 [Herb. Bot. Div. D. S. I. R. 70249a] is V. officinalis var. prostrata Gren. & Godr.; T. J. Hale s.n. [Baraboo, 1861] is xV. perriana Moldenke; and C. Ritchie 57 is in part V. rigida Spreng. and in part some other species.

Löve (1971) cites Murin & Sheikh s.n. from Iraq as the basis for his report of the chromosome count of $2n = 14$ in this species. Guillarmod (1971) cites Dieterlen 329, Guillarmod 444 & 4435, and Laydevant s.n. from Lesotho, deposited in the herbaria at Capetown, the University of Basutoland, the Albany Museum at Grahamstown, and the National Herbarium at Durban. Franchet (1883) cites Franchet 1017 from Turkestan; Banerji (1965) cites Banerji 1069 from Nepal; Deb, Sengupta, & Malick (1968) cite Sengupta 1271, 1275, & 1278 and Deb 329 from Bhutan.

[to be continued]

CERTAMEN MELASTOMATACEIS XIX.

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Initial consideration of the Peruvian collections from the northern outlier of the Cordillera Vilcabamba, Cuzco, and adjacent regions in Huanuco and Ayacucho has been completed; the first results on this material, collected under the aegis of the National Geographic Society and National Science Foundation, were published last year (Phytologia 21, No. 6. July, 1971). Considerable Vilcabamba specimens remain named only to genus, awaiting further collections in flower; there surely are more undescribed species from this region of remarkable endemism. Included in the present discussion are ancillary notes on related species of Miconia, chiefly Bolivian.

MICONIA SUBANDICOLA Wurdack, nom. et stat. nov.

Miconia glandulifera Cogn. var. boliviensis Cogn., Mem. Torrey Club 6: 38. 1896. Non M. boliviensis Cogn., DC. Mon. Phan. 7: 901. 1891.

The closest relative of M. subandicola is perhaps M. aureoides Cogn., which has coarser branchlet pubescence (0.1-0.2 mm long, rather than 0.05 mm), more conspicuously crenate-dentate leaf blades, smaller flowers (petals only 5-5.8 mm long, rather than 7-9.5 mm; large anthers 5 mm long, rather than 6.7-7 mm), torus within sparsely to moderately with gland-tipped hairs (rather than with a fimbriate-ciliolate corona), style subsparingly with gland-tipped hairs ca. 0.1 mm long (rather than moderately to densely puberulous with barbellate hairs to 0.3 mm long), and ovary cone glabrous or very sparsely glandular-puberulous (rather than moderately to densely strigulose).

Miconia aureoides is represented by recent material from Colombia (Putumayo, Schultes & Cabrera 18988), Ecuador (Santiago-Zamora, Cazalet & Pennington 7709, more depauperate than typical), and Peru (Loreto, Killip & Smith 28153, distributed as M. glandulifera; Huanuco, Woytkowski 7901; Cuzco, Madison 10020, co-existing with M. subandicola); Killip & Smith 29528, distributed as this species is actually of Sect. Miconia near M. smaragdina Naud. Collections of M. subandicola are known from Peru (Loreto, Klug 3930, distributed as M. aurea; San Martín, Belshaw 3396, distributed as M. aureoides; Cuzco, Madison 10030, Dudley 10250) and Bolivia (Beni, O. E. White 2330, distributed as M. glandulifera; La Paz, Buchtien 1090, 1092, 1093; Cochabamba, Bang 1173, type number of M. glandulifera var. boliviensis), elev. 200-1600 m. I agree with Macbride's tentative synonymization (Field Mus. Publ. Bot. 13[4]: 414, 433. 1941) of M. glandulifera under M. muricata (Don) Triana. Miconia muricata differs from M. subandicola in the much coarser branchlet and

hypanthial pubescence, noticeably undulate-denticulate leaf blades which are rounded to cordulate at the base, somewhat longer anthers (larger 8.4-8.6 mm long), torus within moderately glandular-setulose (but without a corona), and ovary apex very sparsely with clavate glands 0.05 mm long; a good recent match in floral details for Mathews 1729 is Ferreira 1623, from Huanuco. In Cogniaux' monographic placement, the above-discussed relatives were scattered (spp. 20, 65, 80) among three sections, but all should be together in Sect. Tamonea.

MICONIA HOSPITALIS Wurdack, sp. nov.

M. aureoidi Cogn. affinis, ramorum pubescentia minore foliis integris differt.

Frutex vel arbor parva 3-4.5 m. Ramuli paulo nodosi obscure rotundato-quadrangulati demum teretes cavi paulo infra nodos perforati in nodis linea interpetiolarum obscure armati sicut petioli foliorum venae primariae subtus inflorescentia hypanthiaque sparse pilis granuloso-stellulatis vix 0.05 mm longis latisque armati. Petioli 1.5-4.5 cm longi; lamina (8-)12-25 X (2.5-)3.5-6.5 cm oblongo-elliptica apice mucronulato-acuto vel paulo (usque ad 1.5 cm) gradatimque acuminato basi acuta, membranacea et integra, utrinque in superficie glabra, breviter (0.5-1.5 cm) 3-plinervata (pari exteriori marginali neglecto) nervis secundariis ca. 0.5-0.7 cm inter se distantibus nervulis subtus subplanis laxo reticulatis (areolis ca. 0.7 mm latis). Panicula 8-11 X 5-8 cm submultiflora; flores 5-meri (alabastris maturis solum cognitis), pedicellis 3-4 mm longis et 0-0.2 mm infra hypanthium articulatis, bracteolis mox caducis non visis. Hypanthium (ad torum) 2.6 mm longum; calycis tubus 0.7-0.9 mm altus intus minute (0.1 mm) et densiuscule strigosus, lobis interioribus 0.5 mm altis late ovatis, dentibus exterioribus callosis non liberis inframarginalibus; torus intus glaber vel sparse setulosus. Petala (paulo immatura) 4 X 2 mm obovato-oblonga dense granulosa. Stamina paulo dimorphica; filamenta sparse glanduloso-puberula; thecae (paulo immaturae) 3.7 mm vel 2.8 mm longae, connectivo basaliter glandulis paucis ornato. Stylus basaliter sparse strigosus pilis sparse barbellatis 0.5 mm longis; ovarium 5-loculare et ca. 2/3 inferum, apice conico glabro 10-costato.

Type Collection: Carlos Schunke A-20 (holotype US 1470416), collected at Schunke Hacienda above San Ramón, Depto. Junín, Peru, elev. 1300-1700 m, July 1925.

Paratypes (both Peru, in young bud): Frank Wolfe 12416 (NA, US), from Camp 4 (Peligroso), southwestern slope of Río LluçiaPichis watershed on ascent of Cerros del Sira, Depto. Huánuco, 9° 25' S, 74° 44' W, elev. ca. 1585 m, 28 July 1969; T. R. Dudley 11853 (NA, US), from between San José and Apurimac, eastern massif of the Cordillera Central, Prov. La Mar, Depto. Ayacucho, ca. 12° 42' S, 73° 47' W, elev. 1360-1400 m, 19 Aug. 1968.

Miconia aureoides has pinoid cauline hairs 0.1-0.2 mm long, no

infranodal stem perforations, crenulate-denticulate leaf blades, subpersistent floral bracteoles, probably larger petals, and style sparsely glandular-puberulous nearly to the apex; the larger flowers with internal toral corona and strigulose ovary apices differentiate M. subandicola. The general vegetative aspect of M. hospitalis is like that of M. flaccida Gleason (vide infra), which has quadri-alate branchlets and eglandular anther connectives.

MICONIA FLACCIDA Gleason

In an isotype (US) studied, each of three buds showed 16 stamens (with a minority in each flower smaller), style at the extreme base sparsely glandular-puberulous (0.1-0.15 mm), and ovary completely inferior (without a free cone). Ferreyra 4269 (Divisoria-Aguaita, Loreto) has obovate minutely callose-serrulate leaf blades, 12 stamens in each of two buds, glabrous style, and ovary with a developed 10-costate cone. Ferreyra 995 (Divisoria, Loreto) has flowers (in each of 4 buds) with 10 stamens, style sparsely glandular-puberulous at the extreme base, and ovary with a well-developed cone. Dudley 11843 and Madison 10239 (both from Huanhuachayo, 12° 43' S, 73° 50' W, La Mar, Ayacucho) have 10 stamens in each of numerous dissected buds, smaller hypanthia than in Killip & Smith 25625, glabrous style, and well-developed ovary cone. Other than these permutations, the above-cited collections are alike in the narrowly 4-alate and infra-nodally perforated branchlets, foliage, and floral details. The variability in this material does not seem further resolvable without additional collections.

MICONIA REFLEXIPILA Wurdack, sp. nov.

Sect. Amblyarrhena. M. hamatae Cogn. affinis, inflorescentiarum trichomatibus non crispatis filamentis puberulis differt.

Arbor parva vel frutex 2-9 m. Ramuli primum sulcato-quadrangulati demum teretes sicut petioli inflorescentiaque pilis laevibus paulo vel arcte reflexis plerumque 0.8-1 mm longis dense armati. Petioli 1-2(-2.5) cm longi; lamina 6-15 X 2.5-5(-6) cm late lanceata apice acuto basi late acuta vel anguste obtusa, rigidiuscula et obscure serrulata, supra dense appresso-setosa pilis ad basim prominenter expansis (bulla ca. 0.6 mm lata longaque; apex setulifer ca. 0.6 mm longus), subtus foveolata et densiuscule setulosa pilis laevibus gracilibus usque ad 1 mm longis, 5-plinervata (pari interiore 0.5-1 cm supra basim divergente) nervis secundariis 2-3 mm inter se distantibus nervulis ultimis obscuris densiuscule reticulatis. Panicula 5-7 X 5-7 cm submultiflora; flores 5-meri sessiles interrupto-glomerati (glomerulis 3-5-floris), bracteolis ca. 1 X 0.4 mm ellipticis persistentibus. Hypanthium (ad torum) 1.9-2 mm longum extus dense appresso-setulosum pilis laevibus gracilibus ca. 0.6-0.8 mm longis; calycis tubus 0.3 mm longus, lobis interioribus 1 mm longis oblongis vel ovatis (apice rotundato vel acutiusculo) extus dense strigulosus intus basim

versus sparse strigulosis (pilis intus ca. 0.1 mm longis), dentibus exterioribus setuliferis inframarginalibus obscuris; torus intus glaber. Petala 1.1-1.2 X 1.2-1.4 mm suborbicularia sparse vel sparsissime glanduloso-ciliolata (ciliis 0.03-0.1 mm longis) alioqui glabra. Stamina isomorphica; filamenta 1.3-2.3 mm longa sparse glanduloso-puberula (pilis 0.1-0.3 mm longis); thecae 1-1.3 X 0.5 X 0.4 mm oblongae apice minute uniporoso (poro 0.15 mm diam.), connectivo inconspicue (0.1-0.2 mm) prolongato non appendiculato. Stigma expansum 0.6-0.7 mm diam.; stylus 3.1-3.4 X 0.3 mm modice puberulus (pilis p. p. glanduliferis 0.15-0.2 mm longis gracillimis) in ovarii apicem ca. 0.2 mm immersus; ovarium 5-loculare et 0.6-0.8 inferum, apice conico setulifero setulis ca. 10 eglandulosis ca. 0.3 mm longis.

Type Collection: T. R. Dudley 13244 (holotype US 2658940), collected in dense cloud forest above Camp 3 (Laguna) just below ridge leading to Camp 4 (Peligroso), southwestern slope of the Río LlullaPichis watershed on the ascent of Cerros del Sira, Depto. Huánuco, Peru, 9° 20' S, 74° 45' W, elev. ca. 1330 m, 24 July 1969. "Many-stemmed shrub 6-8 ft. tall; indument bright burgundy-red."

Paratypes (all Peru): Huanuco: F. Wolfe 12322 (NA, US), from Camp 3 (Laguna), ascent of Cerros del Sira, elev. 1290 m. Junín: Killip & Smith 25908 (US), from Porvenir, Pichis Trail, elev. 1500-1900 m. Cuzco, Prov. Convención, Cordillera Vilcabamba, ca. 12° 30' S, ca. 73° 30' W: M. T. Madison 10100 (NA, US) and T. R. Dudley 10436 (NA), from Camp 2 1/2, elev. 1730 m; T. R. Dudley 10372 (NA, US) and 10345 (NA, US), from between Camps 2 1/2 and 3, elev. 1730-2000 m; T. R. Dudley 10434 (NA, US), from Camp 3, elev. 2080 m.

Miconia hamata (Mem. N. Y. Bot. Gard. 16: 20. 1967) has very fine and much crisped cauline, petiolar, and peduncular hairs, as well as (from Gleason's dissection notes on the type at Berlin 1932) glabrous filaments and more numerous (ca. 12) flowers per capitulum; unfortunately recent topotypical collections are still unknown. Another relative, M. ruizii Naud., at least as to the holotype (P), has basally nerved leaf blades, patent stem hairs 1.5-2 mm long, and larger flowers (hypanthium plus calyx tube [dry] 2.8 mm long, rather than 1.8 mm; petals [dry] 1.8-2 mm wide rather than 1-1.2 mm). The Junín collection of M. reflexipila had been distributed as M. radula Cogn. (cf. Bull. Torrey Club 58: 244. 1931; the US sheet however shows puberulous filaments); that species has leaf blades obtusish to rounded at the apex and much larger (and usually somewhat pedicellate) flowers. The Cuzco collections of M. reflexipila are all fruiting.

MICONIA POLYTOPICA Wurdack, sp. nov.

Sect. Amblyarrhena. M. pallasanae Wurdack affinis, foliis distincte plinervatis bracteolis maioribus differt.

Ramuli primum obscure quadrangulati demum teretes sicut petioli foliorum subtus venae primariae inflorescentiaque dense strigosi pilis ascendentibus arcte (vel in inflorescentia laxa)

appressis laevibus 0.7-1.5 mm longis. Petioli 0.8-3 cm longi; lamina (2.5-)5-11 X (1-)2-4.4 cm lanceata vel elliptico-lanceata apice anguste acuto basi late acuta vel obtusa, integra et tenuis vel subcoriacea, supra modice vel dense strigulosa vel strigosa pilis arcte appressis laevibus, subtus laxo strigulosa vel setosa pilis gracilibus laevibus, 5-plinervata pari interiore 0.5-1(-1.7) cm supra basim divergente nervis secundariis ca. 1.5-2 mm inter se distantibus nervulis subtus planis areolis 0.3-0.4 mm latis. Panicula 3-9 cm longa lataque submultiflora; flores 5-meri subsessiles (pedicellis crassis obscuris) interrupto-glomerati, bracteolis 2.7-3.2 X 0.4-0.7 (-1) mm persistentibus. Hypanthium (ad torum) 2-2.7 mm longum extus dense subsericeo-strigulosum vel strigosum pilis gracilibus laevibus; calycis tubus 0.2-0.3 mm altus, lobis interioribus oblongo-rotundatis 0.8-1.2 X 1-1.5 mm extus margines versus glabris intus basim versus glandulis clavatis sparse strigulosus, dentibus exterioribus setuliferis obscuris inframarginalibus; torus intus glaber. Petala 1.8-2.6 X 1.3-1.7 mm plerumque glabra obovato-oblonga apice rotundato-truncato. Stamina isomorphica; filamenta 2.1-2.6 mm longa sparsiuscule glanduloso-puberula pilis 0.1-0.2 mm longis; antherarum thecae 1.6-2 X 0.6-0.7 X 0.45-0.6 mm oblongae poro terminali 0.15-0.2 mm diam.; connectivum nec prolongatum nec appendiculatum. Stigma expansum 0.5-0.7 mm diam.; stylus 4.4-6 X 0.25-0.35 mm modice glanduloso-puberulus in ovarii apicem 0.2-0.3 mm immersus; ovarium 3-4-loculare et 0.7-0.8 inferum, apice conico 0.3-0.5 mm alto costulato modice pilis eglandulosis 0.2-0.4 mm longis coronato; semina laevia 0.7-0.8 X 0.4-0.5 mm.

MICONIA POLYTOPICA subsp. *POLYTOPICA*

Folia tenuia supra pilis plerumque 0.3-0.6 mm longis modice strigulosa subtus sparse vel sparsiuscule laxo-strigulosa pilis 0.3-0.4 mm longis. Hypanthii pili ca. 0.8-1 mm longi.

Type Collection: T. R. Dudley 10346 (holotype US 2626833; isotype NA), collected in dense cloud forest between Camps 2 1/2 and 3 ca. 15 km NE of Hacienda Luisiana and Río Apurimac, Cordillera Vilcabamba, Prov. Convención, Depto. Cuzco, Peru, 12° 35' S, 73° 35' W, elev. 1730-2000 m, 22 June 1968. "Multiple-stemmed arcuate to lax shrub 6-30 ft. tall, 2-3 in. DBH; leaves dark green with red venation; peduncles and pedicels burgundy-red; corolla inside white, outside reddish-purple; anthers golden yellow."

Paratypes: Peru, Prov. Convención, Depto. Cuzco: C. Vargas 3537 (US), from near Pintobamba, elev. 2600 m; T. R. Dudley 10438 (NA) and 10533 (NA, US), M. T. Madison 10103 (NA, US), all topotypical, elev. 1730-2000 m. Bolivia: O. Buchtien 5498 (US), from Hacienda Simaco on trail to Tipuani, Depto. La Paz, elev. 1400 m.

MICONIA POLYTOPICA subsp. *AYACUCHENSIS* Wurdack, subsp. nov.

Folia tenuia supra pilis 0.8-1 mm longis modice induta subtus pilis ca. 1 mm longis paulo appressis dense obsita.

Hypanthii pili 1.5-2(-4) mm longi.

Type Collection: M. T. Madison 10296 (holotype US 2626829; isotype NA), collected in cloud forest in shade above Estera Rohuana ca. 3 km from Huanhuachayo, Capprichio-Puncu trail on west side of Apurimac valley, Prov. La Mar, Depto. Ayacucho, Peru, 12° 43' S, 73° 47' W, elev. ca. 2120 m, 18 July 1970. "Shrub 4 m with pendant foliage; leaves dull green, with scarlet indument on ribs and margins; fruit lavender, 4 mm diam."

Paratype (near-topotypical): T. R. Dudley 11920 (NA, US), ca. 30 km SW of Hacienda Luisiana and Río Apurimac.

MICONIA POLYTOPICA subsp. *HUANUCENSIS* Wurdack, subsp. nov.

Folia subcoriacea supra pilis ca. 1 mm longis densissime induta subtus pilis ca. 1.2 mm longis paulo appressis densissime obsita. Hypanthii pili 1.5-2.5 mm longi.

Type Collection: T. R. Dudley 13521 (holotype US 2626828; isotype NA), collected in open elfin forest between Camp 4 (Peligroso) and Camp 5 (Tabano), southwestern slope of Río LlullaPichis watershed on ascent of Cerros del Sira, Depto. Huanuco, Peru, 9° 25' S, 74° 44' W, elev. ca. 1680 m, 31 July 1969. "Lax many-stemmed shrub 6-10 ft. tall; indument silvery-violet."

Paratype (near-topotypical): F. Wolfe 12431 (NA, US), from between Camp 4 (Peligroso) and summit of the Sira, elev. ca. 1880 m.

The suggested Ecuadorian relative has leaf blades basally nerved or barely (2-3 mm) pseudo-plinerved and inflorescence bracteoles ca. 0.5 mm long. *Miconia obscura* (Bonpl.) DC. (larger leaf blades bullate-setulose above, foveolate and densely setulose beneath) and perhaps *M. lasiocalyx* Cogn. (larger leaf blades, some intermingled stellulate trichomes, patent hypanthial hairs, larger calyx lobes) are more distantly related congeners. To *M. lasiocalyx* have been referred Madison 10278 (Capprichio-Puncu trail, Prov. La Mar, Depto. Ayacucho) and Woytkowski 8196 (Mendoza, Depto. Amazonas); Macbride had earlier (and correctly) referred Pennell 14053 (Río Yanamayo, Depto. Cuzco) to this species. Two collections (Killip & Smith 25628 and 25748, from Eneñas, Pichis Trail, Junín) distributed incorrectly as *M. ruizii* Naud. represent a taxon closely related to *M. polytopica* but with somewhat larger basally nerved or barely pseudo-plinerved leaf blades (trichomes on the upper surface basally somewhat expanded) and sparsely stout-ciliate calyx lobes which are evenly strigulose externally; this material is also suggestive of *M. retropila* Wurdack, but the cauline and inflorescence pubescence is strongly appressed-ascending.

MICONIA PAEMINOSA Wurdack, sp. nov.

Sect. *Amblyarrhena*. *M. pailasanae* Wurdack affinis, ramulorum foliorum hypanthiorumque pubescentia ubique brevior floribus minoribus differt.

Frutex 0.7-1.3 m. Ramuli primum obscure rotundato-

quadrangulati demum teretes sicut inflorescentia modice pilis incurvo-patentibus laevibus ca. 0.5 mm longis armati. Petioli 0.8-2.5 cm longi graciles; lamina (3.5-)5-10 X (1.3-)2-4 cm elliptica vel oblongo-elliptica apice hebeti-acuto basi late acuta vel obtusa, membranacea et obscure denseque ciliolato-serrulata, supra modice aspero-strigulosa pilis vix 0.1 mm longis ad basim expansis, subtus in venis primariis secundariisque sparsiuscule appresso-setulosa (pilis ca. 0.1-0.2 mm longis) in venulis ultimis superficieque glabra, breviter (0.2-0.5 cm) 5-plinervata nervis secundariis ca. 2-2.5 mm inter se distantibus nervulis subtus subplanis densiuscule reticulatis (areolis 0.2-0.3 mm latis). Panicula 4-9 X 3-8 cm pauciflora, ramis primariis oppositis gracilibus; flores 5-meri plerumque breviter (0.5-0.8 mm) pedicellati, bracteolis 0.3-0.5 X 0.1 mm subpersistentibus. Hypanthium (ad torum) 1.7-1.9 mm longum sparse pilis laevibus subappressis ca. 0.2 mm longis indutum; calycis tubus 0.1-0.2 mm longus, lobis interioribus 0.35-0.4 mm longis oblatis glabris, dentibus exterioribus crassis sparse setulosus non eminentibus. Petala 1.1-1.2 X 0.7-0.9 mm obovato-oblonga glabra. Stamina isomorphica; filamenta 1.8-2 mm longa sparse glanduloso-puberula pilis 0.05-0.1 mm longis; antherarum thecae 1.1-1.3 X 0.35 X 0.3 mm oblongae, poro 0.1 mm diam. dorsaliter inclinato, connectivo nec prolongato nec appendiculato. Stigma paulo expansum 0.35-0.5 mm diam.; stylus 5 X 0.25 mm sparse appresso-strigulosus pilis ca. 0.2 mm longis; ovarium 3-loculare et ca. 2/3 inferum, apice conico 0.3-0.5 mm alto setulis paucis 0.1 mm longis coronato.

Type Collection: T. R. Dudley 13185 (holotype US 2626836; isotype NA), collected in dense cloud forest between Camp 3 (Laguna) and Camp 4 (Peligroso), southwestern slope of Río LlulaPichis watershed on ascent of Cerros del Sira, Depto. Huánuco, Peru, 9° 26' S, 74° 45' W, elev. ca. 1450 m, 23 July 1969. "Lax to scandent shrub. Inflorescence violet-purple; anthers golden; fruit bluish."

Paratypes (both near-topotypical): T. R. Dudley 13121 (NA, US), from between Camp 3 and Camp 4, elev. ca. 1400 m; F. Wolfe 12367 (NA, US), from Camp 3, elev. 1290 m.

Miconia pailasana has vegetative pubescence 0.2-0.6 mm long, hypanthial hairs 0.5-1 mm long, calyx lobes 0.6-0.8 mm long, petals 1.8-1.9 X 1.4 mm, and ovarial hairs 0.3-0.35 mm long; also the second primary vein pair is only 0.5-0.8 mm from the leaf margins, rather than 1.5-2.3 mm. Miconia polytopica Wurdack seems more distantly related, having longer vegetative and hypanthial pubescence, much larger bracteoles, and larger flowers.

MICONIA PUNICEA Wurdack, sp. nov.

Sect. Amblyarrhena. De affinitate intima mihi incognita. In aspectu M. ruizii Naud. reminiscente, ramorum pilis barbelatis stigmate non expanso differt.

Ramuli primum subquadrangulares demum teretes sicut petioli foliorum venae primariae subtus inflorescentiarum ramique modice

vel dense pilis erectis vel paulo reflexis laevibus vel sparsissime barbellatis 1-1.5(-2) mm longis et pilis densiuscule barbellatis paulo reflexis ca. 0.3-0.5 mm longis dense (ramulis) vel modice (venis primariis) induti. Petioli 2-3.5(-8) cm longi; lamina 9-15.5(-27.5) X 3.5-8(-17) cm ovata apice longiuscule gradatimque acuminato basi 0.4-0.6(-2) cm cordata, firme membranacea et serrulata (dentibus 0.5-0.7(-1) mm profundis et 2[-4] mm inter se distantibus), supra modice bullato-setosa bullis 0.5-0.7 X 0.3-0.5 mm setis laevibus 1-1.5 mm longis, subtus foveolata et densiuscule pilis crispulis laevibus 0.5-0.8 mm longis setulosa, 7(-9)-nervata nervis secundariis 3-5 mm inter se distantibus nervulis ultimis subtus planis obscuris areolis 0.2-0.3 mm latis. Panicula 8-10 cm longa; flores 5-meri sessiles in ramulis 1-2.5 cm longis racemosi, bracteolis 0.3-0.5 mm longis persistentibus setulosi. Hypanthium (ad torum) 2 mm longum extus dense setulosum pilis 1-1.3 mm longis laevibus vel sparsissime barbellatis; calycis tubus 0.2 mm altus, lobis interioribus 1.2 X 0.8 mm oblongo-ovatis extus basim versus sparse setulosi intus (glandulis minutis clavatis exceptis) glabris, dentibus exterioribus setuliferis divaricatis 0.5 mm longis non eminentibus. Petala 2.2 X 1.5 mm obovato-oblonga glabra. Stamina isomorphica glabra; filamenta 2 mm longa; thecae 1.7 X 0.5 X 0.5 mm oblongae poro 0.15 mm diam., connectivo paulo (0.4 mm) prolongato non appendiculato. Stigma paullulo clavato-expansum 0.3 mm diam.; stylus 4.7 X 0.2 mm glaber in ovarii apicem 0.5 mm immersus; ovarium 5-loculare apice conico 0.6 mm alto glabro.

Type Collection: T. R. Dudley 10663 (holotype US 2658935), collected in ceja in rainforest and cloudforest between Camps 2 1/2 and 3 ca. 15 km from Hacienda Luisiana and Río Apurímac, Cordillera Vilcabamba, Prov. Convención, Depto. Cuzco, Peru, elev. 1730-2080 m, 1 July 1968. "Very common shrub 6-15 ft; indument red."

Paratypes (same general region): T. R. Dudley 10815 (NA, US, in young bud), from between Camps 3 and 4, elev. 2350 m; M. T. Madison 10105 (NA; sterile), from Camp 2 1/2, elev. 1730 m.

Miconia ruizii differs at least in the smooth cauline hairs and capitellate stigmas. In petals, stamens, and pistil, M. hirta Cogn. is similar; that Bolivian species differs in the longer, stiffer, and sparser large cauline hairs (ca. 3 mm long), the rugose leaf blades with much sparser pubescence, the esetulose hypanthia, and shorter calyx lobes (0.3 mm long) with tufts of subbasal gland-tipped hairs externally. Another distant relative (ex char. and notes from the holotype, P) is perhaps M. staphidioides (Naud.) Triana, with strongly barbellate or stipitate-stellate cauline hairs ca. 1 mm long, densely barbellate hypanthial hairs, and densely setulose ovary apex, but similar stamens, stigma, and style. The general aspect of M. punicea, particularly the spicate inflorescence branches, is like that of M. aeruginosa Naud. (Sect. Miconia) or some of the hispid species of Sect. Cremanium.

MICONIA MADISONII Wurdack, sp. nov.

Sect. Amblyarrhena. M. lasiostylae Gleason et M. modicae Macbride affinis, ramis arcte quadrangulatis alatis (alis crassis ca. 0.5 mm altis), calycis lobis et petalis maioribus differt.

Rami arcte quadrangulati sicut petioli laminarum venae primariae subtus inflorescentia hypanthiaque dense pilis pinoideo-stellulatis 0.05-0.1(-0.2) mm longis demum caducis induti. Petioli 1-2 cm longi sparse pilis laevibus 0.3-0.5 mm longis inconspicue caduceque glanduliferis armati; lamina 12-20 X 4.5-7 cm elliptica apice basique acuto, firme membranacea et integra, obsolete ciliolata ciliolis distantibus crassis appressis ca. 0.1 mm longis, supra glabra, subtus in venulis superficiei sparse subsistententerque puberula pilis stellulatis ca. 0.2 mm latis sessilibus vel breviter (0.1 mm) stipitatis, 5-plinervata (pari tenui inframarginali neglecto) pari interiore ca. 1-1.5 cm supra basim subalternatim divergenti nervis secundariis ca. 4 mm inter se distantibus venulis ultimis subtus planis areolis ca. 0.6 mm latis. Panicula ca. 14 cm longa pauciflora; flores 5-meri, pedicellis 1-2(-3) mm longis, bracteolis ca. 2.5 X 0.5 mm lineari-lanceatis ante anthesim caducis. Hypanthium (ad torum) 4 mm longum intus paulo 10-costatum; calycis tubus 0.6-0.7 mm longus, lobis interioribus 2 X 3.5 mm oblatis, dentibus exterioribus crassis appressis inframarginalibus; torus intus sparse glanduloso-puberulus pilis 0.05 mm longis. Petala 6 X 5-5.7 mm obovato-suborbicularia dense granulosa extus sparse stellulato-puberula. Stamina isomorphica; filamenta 4.8 mm longa densiuscule glanduloso-puberula pilis 0.05-0.1 mm longis; thecae 3 X 1.5 X 1.2 mm rectae crasse oblongae poro 0.6 mm diam. dorsaliter inclinato, connectivo nec prolongato nec appendiculato. Stigma expansum 2.1 mm diam.; stylus 7 X 1 mm dense glanduloso-puberulus; ovarium 5-loculare et 2/3 inferum, apice conico costato 0.8 mm alto glabro.

Type Collection: M. T. Madison 10295 (holotype US 2626762; isotype NA), collected in cloud forest on the Capprichio-Puncu trail above Estera Rohuana (ca. 3 km from Huanhuachayo) on west side of Río Apurímac valley, Prov. La Mar, Depto. Ayacucho, Peru, 12° 43' S, 73° 47' W, elev. ca. 2224 m, 18 July 1970. "Shrub 5 m. Leaves dull green, with tan scurfy indument below. Calyx white, with rufous hairs; corolla and stigma white; stamens bright yellow. Common."

Both suggested relatives have rotund-tetragonal branches lacking the corneous elevations at the petiole insertions, sepals only ca. 0.5-0.7 mm long, and petals only 2.5-5 mm long. Certainly M. madisonii and the two next-described species are in the general affinity of M. floribunda (Bonpl.) DC.; that species, at least as far as the Bonpland collection (P) is concerned, has rotund-tetragonal branches, calyx lobes only 0.8 mm long, and anthers bent at almost a right angle at the base with both thecae and connective well-prolonged ventrally beyond the filament insertion. Certainly within the Colombian material

currently ascribed to M. floribunda are several distinct species

MICONIA INCACHACANA Wurdack, sp. nov.

Sect. Amblyarrhena. M. madisonii Wurdack affinis, foliorum subtus pilis longioribus floribus minoribus ovarii collo modice glanduloso-ciliolato differt.

Rami arcte alato-quadrangulares (alis crassis ca. 0.6 mm altis) primum sicut petioli foliorum subtus venae primariae inflorescentia hypanthiaque densiuscule pilis pinoideis ca. 0.1-0.15 mm longis induti demum glabrati. Petioli 1-2.5 cm longi; lamina 10-18 X 4.5-7.5 cm elliptica apice acuto basi obtusa, firme membranacea et integra, supra glabra, subtus in superficie sparsiuscule pilis subclavatis 0.2-0.4 mm longis apicem versus barbellatis investa, breviter (ca. 0.5 cm) 5-plinervata (pari exteriori tenui inframarginali neglecto) nervis secundariis ca. 4-5 mm inter se distantibus nervulis ultimis subtus planis areolis ca. 0.5 mm latis. Panicula 19 X 6 cm multiflora ramis ascendentibus; flores 5-meri, pedicellis ca. 3 mm longis, bracteolis 3.5-5 X 0.2-0.3 mm demum caducis. Hypanthium (ad torum) 3.4-3.6 mm longum intus paullo 10-costatum; calycis tubus 0.5 mm altus, lobis interioribus 0.7 X 3 mm oblatis, dentibus exterioribus vix evolutis non eminentibus; torus intus glaber. Petala 4.8-5 X 4.2 mm obovato-orbicularia dense granulosa extus sparse caduceque stellulato-puberula. Stamina isomorphica; filamenta 4 mm longa modice pilis glanduliferis ca. 0.1 mm longis obsita; thecae 2.5 X 1.1 X 1.3 mm crasse oblongae poro 0.5-0.6 mm diam. dorsaliter inclinato, connectivo nec prolongato nec appendiculato. Stigma expansum 1.6 mm diam.; stylus densiuscule pilis glanduliferis ca. 0.1 mm longis indutus; ovarium 5-loculare et 0.8 inferum, collo 0.6 mm alto modice pilis glanduliferis 0.1 mm longis coronato.

Type Collection: J. Steinbach 9459 (holotype US 1857472), collected in forest at Incachaca, Prov. Chapare, Depto. Cochabamba, Bolivia, elev. 2200 m, Feb. 1929. "Baum 8 m."

Miconia madisonii has much shorter foliar hairs, somewhat larger flowers, and glabrous ovary apices. Miconia modica Macbride has obtusely tetragonal branches, shorter leaf indument, and slightly smaller flowers (hypanthium plus calyx tube ca. 2.5 mm long dry, rather than ca. 3.5 mm). Miconia lasiostyla Gleason has obtusely tetragonal branches, strongly plinerved leaf blades, and considerably smaller subsessile flowers (but a glandular-setulose ovary apex).

MICONIA TERBORGHII Wurdack, sp. nov.

Sect. Amblyarrhena. M. madisonii Wurdack affinis, foliorum subtus pilis minoribus mox caducis petalis stigmatique maioribus ovarii apice glabro differt.

Frutex vel arbor parva 3-6 m. Rami arcte quadrangulati (alis crassis 0.7-1 mm altis) ad nodos linea cornea transversali 1-1.5 mm alta armati sicut petioli foliorum subtus venae primariae secundariaeque inflorescentia hypanthiaque pilis

pinoideis ca. 0.03-0.05 mm altis latisque demum caducis sparse vel modice armati. Petioli (1.5-)3-4(-6) cm longi; lamina 12-22(-26) X 5-10.5 cm elliptica vel oblongo-elliptica apice acuto vel paullo (usque ad 1 cm) acuminato basi late acuta vel obtusa, firme membranacea vel subcoriacea, integra vel obscure distanterque calloso-serrulata, ubique primum sparse stellulato-puberula (pilis 0.05-0.07 mm latis sessilibus) mox glabrata, breviter (0.5-1.5 cm) 5-plinervata (pari exteriori inframarginali tenui neglecto) nervis secundariis ca. 4-5 mm inter se distantibus nervulis subtus planis areolis irregularibus ca. 0.8-1 mm latis. Panicula 15-30 cm longa multiflora, ramis ascendentibus; flores 5-meri, pedicellis 2-4 mm longis, bracteolis 1.3-2 X 0.1-0.2 mm linearibus mox caducis. Hypanthium (ad torum) 3.4-3.7 mm longum intus paullo 10-costatum; calycis tubus 0.1-0.2 mm altus, lobis interioribus 1.2-1.4 X 3 mm oblati, dentibus exterioribus crassis appressis non eminentibus; torus intus glaber. Petala 7-8.5 X 5.8-8 mm obovato-suborbicularia dense minutissimeque granulosa. Stamina isomorphica; filamenta 5-6 mm longa modice pilis glanduliferis 0.1-0.15 mm longis obsita; thecae 3-3.4 X 1.6-1.8 X 1.6-1.7 mm crasse oblongae poro 0.6 mm diam. ventraliter inclinato, connectivo nec prolongato nec appendiculato. Stigma expansum 2.3-2.4 mm diam.; stylus 5.5-7 X 0.9 mm densiuscule pilis glanduliferis 0.1-0.2 mm longis indutus in ovarii apicem 0.1-0.2 mm immersus; ovarium 5-loculare et ca. 2/3 inferum, apice conico costato ca. 1 mm alto glabro.

Type Collection: T. R. Dudley 10890 (holotype US 2626763; isotype NA), collected just below Camp 5 ca. 23 km NE from Hacienda Luisiana and Río Apurímac, Cordillera Vilcabamba, Prov. Convención, Depto. Cuzco, Peru, 12° 35' S, 73° 35' W, elev. ca. 2700 m, 9 July 1968. "Shrub to 20 ft. tall; petioles red. Calyx deep purple; corolla purplish in bud, opening whitish-pink; anthers deep orange."

Paratypes (all near-topotypical): M. T. Madison 10146 (NA, US), from Camp 4, elev. 2663 m; T. R. Dudley 10794 (NA, US), from between Camps 4 and 5, elev. 2600-2750 m; T. R. Dudley 10772 (NA, US), from just below Camp 5, elev. 2700 m.

Miconia madisonii, M. incachacana, and M. terborghii all have sharply alate-quadrangular branches, but differ markedly in pubescence quality as well as (to a lesser extent) floral details. John Terborgh has been the factotum in the Vilcabamba explorations as well as the principal zoological collector.

MICONIA MONZONENSIS Cogn. subsp. CUZCOENSIS Wurdack, subsp. nov.

Folia longiuscule acuminata hypanthia paulo minora differt.

Type Collection: M. T. Madison 10147 (holotype US 2626751; isotype NA), collected in elfin forest near Camp 4, Cordillera Vilcabamba on east side of Río Apurímac across from Hacienda Luisiana, Prov. Convención, Depto. Cuzco, Peru, 12° 37' S, 73° 33' W, elev. ca. 2568 m, 26 June 1970. "Small tree 2-3 m; leaves glossy light green with red ribs. Corolla and filaments white; anthers bright yellow. Common."

Paratype (near-topotypical): T. R. Dudley 10694 (NA, US),

from between Camps 4 and 5, elev. ca. 2510 m.

The typical subspecies has leaf apices very shortly and bluntly acute and hypanthium plus calyx ca. 3 mm long (dry), while the Cuzco subspecies has leaf apices subcaudate-acuminate for 1-2 cm and hypanthium plus calyx ca. 2.3 mm long (dry).

MICONIA KOEPCKEANA Wurdack, sp. nov.

Sect. *Amblyarrhena*. *M. monzonensis* Cogn. affinis, foliis minoribus basim versus attenuatis floribus minoribus differ.

Ramuli argute quadrangulati (costis crassis 0.1-0.15 mm altis) primum sparse resinoso-granulosi glabrati. Petioli liberi 0.3-0.5 cm longi; lamina 4-6 X 1.4-2 cm elliptica apice hebeti-acuto basi anguste acuta, subcoriacea et integerrima, glabra, breviter (ca. 0.5 cm) 3-plinervata nervis secundariis paulo obscuris ca. 2 mm inter se distantibus venulis supra invisibilibus subtus planis areolis ca. 0.4 mm latis. Panicula 5-10 cm longa (pedunculo ca. 3 cm longo incluso) submultiflora; flores 5-meri plerumque in ramulis terminales plerumque 3-glomerati, pedicellis 0.3-0.5 mm longis, bracteolis ca. 2 X 0.25 mm caducis. Hypanthium (ad torum) 1.9 mm longum extus sparse resinoso-granulosum; calycis tubus 0.1 mm altus, lobis interioribus 0.3-0.4 mm longis deltoideis remotis, dentibus exterioribus obscuris omnino adhaerentibus non eminentibus. Petala 1.5-1.6 X 1.1-1.2 mm obovato-suborbicularia extus glabra intus minutissime granulosa. Stamina isomorphica glabra; filamenta 2.5 mm longa; thecae 1.3 X 0.5 X 0.4 mm oblongae poro 0.1 mm diam. dorsaliter inclinato, connectivo simplici. Stigma paullulo expansum 0.3 mm diam.; stylus 6.6 X 0.25 mm glaber vel sparsissime glandulis 0.05 mm longis obsitus in ovarii apicem 0.2 mm immersus; ovarium 3-loculare et ca. 3/4 inferum, apice conico 0.3 mm alto glabro.

Type Collection: T. R. Dudley 13143 (holotype US 2658937), collected in elfin forest about halfway between Camps 2 and 3, ascent of Cerros del Sira, southwestern slope of the Río LlullaPichis watershed, Depto. Huánuco, Peru, 9° 27' S, 74° 46' W, elev. ca. 1000 m, 23 July 1969. "Shrub ca. 4 ft.; leaves glossy green above. Flowers white; anthers yellow."

Paratypes (both near-topotypical): F. Wolfe 12413 (NA, US), from just below Camp 4, elev. 1480 m; T. R. Dudley 13127B (NA), from between Camps 2 and 3, elev. ca. 1000 m.

Miconia monzonensis has leaf blades 2.5-4 cm wide with rounded bases, as well as considerably larger flowers (hypanthium 2.2-3 mm long; petals ca. 2 mm long) on longer pedicels (ca. 1 mm) and with more expanded (0.5-0.7 mm) stigmas. The species epithet commemorates Drs. H. W. and Maria Koepcke, whose hospitality at Casa Humboldt in Lima was much appreciated by visiting scientists and whose zoological and ecological works are landmarks in Peruvian natural history. Maria Koepcke, tragically killed in an airplane crash, accompanied Dr. Dudley during his Sira trip.

MICONIA WOLFEI Wurdack, sp. nov.

Sect. Amblyarrhena. M. monzonensi Cogn. affinis foliis ad basim attenuatis calycis lobis longioribus differt. A M. koeppckeanae Wurdack differt foliis plerumque latioribus floribus maioribus calycis lobis longioribus ovarii apice glanduloso-puberulo.

Ramuli argute quadrangulati (alis crassis ca. 0.5 mm altis) sicut inflorescentia hypanthiaque primum sparse resinoso-furfuracei glabrati. Petioli ca. 0.5 cm longi; lamina 5-7 X (1.5-) 2-3 cm elliptica apice hebeti-acuto basi acuta, subcoriacea et obscure distanterque serrulata, glabra, breviter (0.3-0.5 cm) 3-plinervata (pari exteriori inframarginali tenui neglecto) nervis secundariis ca. 2-2.5 mm inter se distantibus subtus elevatis nervulis ultimis subtus planis areolis ca. 0.3-0.4 mm latis. Panicula 4-7 cm longa submultiflora; flores 5-meri, pedicellis (1.5-) 2.2-3 mm longis, bracteolis ca. 1.5 X 0.1-0.2 mm valde caducis. Hypanthium (ad torum) 1.8-1.9 mm longum; calycis tubus 0.2 mm longus, lobis interioribus 1-1.2 mm longis, dentibus exterioribus crassis adhaerentibus lobos interiores aequantibus. Petala 2.1 X 1.8 mm suborbicularia extus glabra intus minutissime pruinoso-granulosa. Stamina isomorphica glabra; filamenta 2.3 mm longa; thecae ca. 1.4 X 0.6 X 0.5 mm oblongae poro 0.1 mm diam. dorsaliter inclinato, connectivo dorsaliter ad basim obscure dentato. Stigma paullulo expansum 0.25 mm diam.; stylus 4.7 X 0.2 mm basim versus sparsissime glanduloso-puberulus in ovarii apicem ca. 0.2 mm immersus; ovarium 3-loculare et ca. 0.8 inferum, apice conico lobulato pilis glanduliferis 0.05-0.1 mm longis modice coronato.

Type Collection: F. Wolfe 12429 (holotype US 2626752; isotype NA), collected in cloud forest between Camp 4 and summit of Cerros del Sira, southwestern slope of Río LlullaPichis watershed, Depto. Huanuco, Peru, 9° 25' S, 74° 43' W, elev. ca. 1880 m, 29 July 1969. "Shrub 6 ft. tall. Flowers white."

Paratypes (both near topotypical, in bud): F. Wolfe 12445 (NA, US) and 12447 (NA, US), from near the summit of Cerros del Sira, elev. 2200 m.

Miconia monzonensis has basally rounded leaf blades, calyx lobes ca. 0.5-0.7 mm long, and glabrous ovary apices; M. koeppckeanae has entire leaf blades only 1.4-2 cm wide, smaller flowers on much shorter pedicels, and glabrous ovary apices. Miconia longisepala Gleason does not seem to be an intimate relative of M. wolfei, having thinner acuminate basally nerved leaf blades, densely glandular-puberulous filaments and style, and a much-expanded stigma. Other species in this general alliance recently described by me (M. carpishana, M. beneolens, M. cajanumana, M. tachirensis, M. pausana) differ in other details.

MICONIA ALIGERA Wurdack, sp. nov.

Sect. Amblyarrhena. M. monzonensi Cogn. affinis, foliis proportionaliter angustioribus ad apicem caudato-acuminatis ad basim attenuatis venulis subtus laxioribus differt.

Rami prominenter alato-quadrangulati (alis 1.5-2 mm altis)

primum sicut folia inflorescentia hypanthiaque sparse resinoso-furfuracei mox glabrati. Petioli liberi ca. 0.5-0.8 cm longi; lamina (acumine excluso) 9.5-19 X 3-6.5 cm oblongo-elliptica apice per 1-1.5 cm caudato-acuminato basi anguste acuta et in petiolem decurrente, firme membranacea et integra, obscure calloso-ciliolata, breviter (0.4-0.8 cm) 3-plinervata (pari exteriori ca. 2-3 mm inframarginali) nervis secundariis plerumque 4-5 mm inter se distantibus nervulis subtus planis areolis ca. 0.4 mm latis. Panicula 6-8 cm longa multiflora, ramis ramulisque breviter (0.5-1 mm) 4-alatis; flores 5-meri subsessilis (pedicellis ca. 0.3 mm longis) in ramulorum apices 3-4-glomerulati, bracteolis 2.3-2.6 X 0.3-0.4 mm acutis usque ad anthesim persistentibus. Hypanthium (ad torum) 2.6-2.7 mm longum teres; calycis tubus ca. 0.2 mm longus, lobis interioribus ca. 0.2 mm longis remotis, dentibus exterioribus obscuris appressis non eminentibus; torus intus obscure sparsissimeque glandulis 0.05 mm longis ornatus. Petala 1.7 X 1.1-1.2 mm obovato-suborbicularia minutissime granuloso-pruinosa. Stamina isomorphica glabra; filamenta 2.4 mm longa; thecae 1.9-2 X 0.7 X 0.5 mm oblongae ventraliter ad basim per ca. 0.1 mm steriles poro 0.1-0.15 mm diam. dorsaliter inclinato, connectivo non prolongato dorsaliter ad basim obscure (ca. 0.1 mm) hebeti-dentato. Stigma paulo expansum 0.6 mm diam.; stylus 6 X 0.3-0.5 mm apicem versus expansus basim versus sparsissime glandulis 0.05-0.1 mm longis obsitus in ovarii apicem ca. 0.3 mm immersus; ovarium 5-loculare et ca. 3/4 inferum, apice conico 0.4 mm alto sparsissime glandulis sessilibus coronato.

Type Collection: T. R. Dudley 11261 (holotype US 2658934), collected in rainforest and low cloudforest at Camp 3 ca. 15 km NE of Hacienda Luisiana and Río Apurimac, Cordillera Vilcabamba, Prov. Convención, Depto. Cuzco, Peru, 12° 30' S, 74° 30' W, elev. 2080 m, 21 July 1968. "Large shrub to small tree 10-30 ft. tall, DBH 3"-6", with dense columnar crown; young leaves bronze. Corolla white; anthers bright orange. Common melastome at this altitude."

Paratype (topotypical): T. R. Dudley 10612 (NA, US).

Miconia monzonensis has narrower branch wings (ca. 0.6 mm high), apically bluntly acute and basally obtuse leaf blades only about twice as long as wide, and leaf veinlets densely reticulate beneath (areoles ca. 0.25 mm wide). Other species of Sect. Amblyarrhena with sharply quadrangular branches (M. bailloniana Macbride, M. expansa Gleason) are not very closely related, having 5-plinerved leaf blades and much larger flowers (petals 4-5 mm long). One sterile collection, Madison 10285 (NA) from the Capprichio-Puncu trail, Prov. La Mar, Depto. Ayacucho, elev. 1980 m, may also represent M. aligera.

MICONIA ADINANTHA Wurdack, sp. nov.

In aspectu M. elatae (Sw.) DC. affinis, inflorescentiae ramis in quoque nodo 4 ovarii apice glabro differt.

Ramuli obtuse tetragoni sicut folia subtus inflorescentia hypanthiaque densissime stellulato-puberuli pilis ca. 0.25 mm

diam. Petioli 1.5-2.5 cm longi; lamina 13-20 X 5-8 cm obovato-elliptica apice breviter (0.5-1 cm) subgradatimque acuminato basi acuta, subcoriacea et obscure distanterque undulato-serrulata, supra glabra, 3-nervata (pari exteriori ca. 1 mm infra-marginali tenui neglecto) nervis secundariis ca. 5 mm inter se distantibus subtus prominentibus nervulis subtus planis (areolis ca. 0.3 mm latis) ob pilos occultis. Panicula 10-15 X 7-12 cm multiflora, ramis primariis in quoque nodo 4(-6); flores (5-)6-meri diplostemoni subsessiles (pedicellis obscuris ca. 0.2 mm longis) in ramulis conferte interrupto-glomerati, bracteolis mox caducis non visis. Hypanthium (ad torum) 1.2 mm longum; calycis tubus 0.2 mm altus, lobis interioribus ca. 0.1 mm longis, dentibus exterioribus obscuris non eminentibus. Petala 1.6-1.7 X 1 mm oblongo-obovata obscure granulosa. Stamina paullulo dimorphica glabra; filamenta 1.6 mm longa; thecae 1-1.2 X 0.45 mm oblongae late biporosae, connectivo ad basim ventraliter paullulo (0.1 mm) bilobulato dorsaliter minute (0.1-0.15 mm) dentato. Stigma paullulo expansum 0.25 mm diam.; stylus 4.2 X 0.2 mm glaber; ovarium 3-loculare et 3/4 inferum, apice conico 0.1-0.15 mm alto glabro.

Type Collection: T. R. Dudley 10384 (holotype US 2626822; isotype NA), collected in undisturbed cloud forest at Camp 2 1/2 12 km NE of Hacienda Luisiana and Río Apurímac, Cordillera Vilcabamba, Prov. Convención, Depto. Cuzco, Peru, 12° 30' S, 73° 30' W, elev. 1730 m, 23 June 1968. "Tree 50-60 ft. with dense rounded crown, DBH 6-8 inches; phloem pale pink. Leaves dark green and glossy above, with dense rufous indument beneath. Flowers creamy-white."

Despite the plethora of Andean and subandean species with large discolored leaf blades, I am at a loss to discover the really close affinities of M. adinantha. Miconia elata has distinctly 5-nerved leaf blades, opposite inflorescence branches, and stellulate-puberulous ovary apices; the only collection (fruiting) of M. elata known from south of Colombia is C. M. Belshaw 3472 (US), from Lamas-San Antonio, Depto. San Martín, Peru. Among the species with four inflorescence branches per node (variously separated in Cogniaux' system, but surely more closely related than now indicated), M. crassipes Triana, M. pavoniana Naud., M. ioneura Griseb., and M. herrerae Gleason all have larger pleiostemonous (15-24 stamens per flower) flowers, the first-mentioned also showing stellulate-puberulous ovary apices. Miconia multiflora Cogn. and M. molybdea Naud. have petals externally sparsely to moderately stellulate-puberulous and anther connectives glandular at the base. Miconia hygrophila Naud., with inflorescence branches 4 per node, is dioecious and with sparser stipitate-stellulate hairs on the lower leaf surfaces. My survey for relatives of M. adinantha did not include the eastern Brazilian species of Sect. Glossocentrum, but all these differ at least vegetatively.

MICONIA RECONDITA Wurdack, sp. nov.

Sect. Cremanium. M. neriifoliae Triana, M. floccosae Cogn.

et M. biacutae Cogn. affinis, foliis subtus in superficie glabratis inflorescentiae ramis sparse glanduloso-setulosis differt.

Ramuli argute quadrangulati sicut foliorum subtus venae primariae inflorescentiae ramique primum molice pinoideo-puberuli demum glabrati. Petioli 1-2.5 cm longi; lamina 7-12 X 2.5-3.5 cm anguste elliptico-oblonga apice late hebeti-acuto basi obtusa vel paulo rotundata, coriacea et distanter obscureque callososerrulata, supra glabra, subtus in superficie primum sparsiuscule pinoideo-puberula (pilis demum caducis) et secus nervos primarios praecipue basim versus sparsissime glanduloso-setulosa, 3-nervata (pari exteriori inframarginali neglecto) nervis secundariis 2-3 mm inter se distantibus nervulis subtus planis obscuris (areolis ca. 0.5 mm latis). Panícula 4-7 cm longa submultiflora, ramulis oppositis pilis laevibus glanduliferis ca. 0.3 mm longis sparse setulosis; flores 5-meri crasse pedicellati (pedicellis ca. 1 mm longis), bracteolis valde caducis non visis. Hypanthium (ad torum) 3.4 mm longum extus sparse (praecipue basim versus) pinoideo-puberulum demum glabratum; calycis tubus 0.4 mm altus, lobis interioribus 0.5-0.6 mm altis rotundatis, dentibus exterioribus crassis non eminentibus. Petala glabra 2.6-2.9 X 2.6-2.7 mm suborbicularia, apice retuso. Stamina paullulo dimorphica glabra; filamenta 2.3 mm longa basim versus dilatata; antherarum thecae 1.9 X 0.8 X 0.7 mm vel 1.6 X 0.9-1 X 0.7 mm obovato-oblongae late biporosae, connectivo ad basim ventraliter ca. 0.2-0.3 mm prolongato bilobulato. Stigma paulo expansum 0.8 mm diam.; stylus 3.3 X 0.6 mm glaber; ovarium 2(?)-loculare et 2/3 inferum, apice conico 1 mm alto glabro.

Type Collection: M. Bang 2485 (holotype US 1416564; isotype US), collected at Unduavi, Depto. La Paz, Bolivia, Sept. 1894.

The three suggested relatives all have leaf blades beneath and hypanthia completely and persistently covered with pinoid (long-barbellate, appearing flocculose) hairs and also lack glandular inflorescence hairs; the flowers of both M. neriifolia and M. biacuta (the species perhaps doubtfully distinct) are smaller (hypanthium to the torus 1.8-2.5 mm long; petals 1.5-2 X 1.2-1.7 mm), while M. floccosa (misplaced originally in Sect. Miconia) has petals (fide Cogniaux) 5 mm long. Bang 2485 was originally distributed as M. granulosa (Bonpl.) Naud. (correctly M. biappendiculata), which has quite different vegetative pubescence, relatively wider leaf blades, and smaller flowers. I have not seen the Bolivian collection (by d'Orbigny) cited by Cogniaux for M. granulosa, but feel sure that the north Colombian species does not really occur further south.

MICONIA DEMISSIFOLIA Wurdack, sp. nov.

Sect. Cremanium. M. caelatae (Bonpl.) DC. affinis, pubescentia compactiore antherarum thecis minoribus connectivo plus prolongato differt.

Arbor parva vel frutex 2-5 m. Ramuli obtuse tetragoni demum teretes sicut foliorum subtus venae primariae

secundariaeque inflorescentiaque dense pilis pinoideis 0.1(-0.2) mm longis (barbellis ca. 0.01-0.02 mm longis) induti. Petioli 1.5-2.5 (-3) cm longi; lamina (acumina excluso) 6-12 X 2-4(-5) cm apice longiuscule (0.7-1.8 cm) subcaudato-acuminato basi obtusa, coriacea et callosa-serrulata, supra glabra et obscure rugulosa, subtus in venulis superficieque sparsiuscule pinoideo-puberula, 3-nervata (pari 0.5-1 mm inframarginali tenui neglecto) nervis secundariis ca. 2-2.5 mm inter se distantibus subtus elevatis nervulis subtus planis laxiuscule reticulatis (areolis ca. 0.7 mm latis) ob pilos occultis. Panicula 8-14 cm longa multiflora, ramis primariis oppositis; flores 5-meri, pedicellis ca. 1 mm longis, bracteolis ca. 1.2 X 0.3 mm valde caducis. Hypanthium (ad torum) 1.5 mm longum sparse stellulato-pinoideo-puberulum; calycis tubus 0.2 mm altus, lobis interioribus 0.25 mm longis ovatis, dentibus exterioribus crassis lobos interiores aequantibus. Petala glabra 1.3 X 0.9-1 mm obovato-suborbicularia apice retusa. Stamina isomorphica glabra; filamenta 1.5-1.6 mm longa; antherarum thecae 0.7 X 0.5 mm obovato-suborbiculares late biporosae, connectivo ad basim 0.4-0.5 mm prolongato 0.25 mm lato. Stigma (in specimine florifero typico) 0.2 mm diam. non expansum; stylus 1.5 X 0.2 mm glaber vix exsertus in ovarii apicem 0.3 mm immersus; ovarium 3-loculare et ca. 1/2 inferum, apice conico 0.6 mm alto sparsiuscule glandulis ca. 0.1 mm longis coronato.

Type Collection: M. T. Madison 10168 (holotype US 2626799; isotype NA), collected in full sun in elfin forest near Camp 6, Cordillera Vilcabamba across from Hacienda Luisiana, Prov. Convención, Depto. Cuzco, Peru, 12° 36' S, 73° 30' W, elev. 3300-3535 m, 28 June 1970. "Tree 3-5 m; leaves stiffly pendant, glossy green above, with dense ochre tomentum below. Calyx green; other floral parts light yellow. Fruit deep violet. Common."

Paratypes (both Peru): T. R. Dudley 11208 (NA, US), from Camp 7, Cordillera Vilcabamba, Depto. Cuzco, elev. 3400 m; M. T. Madison 10356 (NA, sterile), from near Puncu ca. 30 km NE of Tambo on west side of Apurimac valley, Prov. La Mar, Depto. Ayacucho, elev. ca. 3380 m.

The suggested Ecuadorian relative has stem hairs ca. 0.5 mm long, lower leaf surface hairs with longer (0.1-0.15 mm) enations, pedicels ca. 0.2 mm long, and oblong anther thecae with the connective only 0.1 mm trilobulate at the base. (Among the Ecuadorian collections [US] currently ascribed to M. caelata, two taxa are involved, Camp E-4565 and E-4566 probably representing an undescribed species with the dominant underleaf hairs quite different from those in the Jameson material). Probably both species are functionally dioecious, only sporadic anthers on the Jameson collections of M. caelata being well-formed (but stigma expanded) and the stigma in buds of Dudley 11208 being well-expanded (ca. 0.6 mm diam.). The holotype of M. demissifolia has one fruiting sprig and one in flower (with well-developed anthers and non-expanded stigma). Other more northerly relatives of M. demissifolia include M. bracteolata

(Bonpl.) DC. and M. biappendiculata (Naud.) Uribe, both with more discrete foliar hairs (granulose in appearance, the enations extremely short) and larger flowers with oblong anthers; M. mutisiana Mgf. differs at least in the entire leaf blades with less dense, more compact, and caducous hairs on the lower surface. The general vegetative aspect of M. demissifolia is like that of M. hygrophila Naud., which has much longer enations on the lower leaf surface hairs ("cladonioid") and primary inflorescence branches 4 per node, as well as shorter (0.2-0.3 mm) pedicels, but similar stamens.

MICONIA MICROPETALA Cogn.

Miconia torta Gleason, Phytologia 3: 349. 1950.

Cardenas 3984 (isotype US) fits within the variability previously cited for M. micropetala (Phytologia 9: 421. 1964), resembling Wurdack 1440 in the sparser development of simple hairs on the lower leaf surfaces. A recent series of M. micropetala from Cuzco (Cordillera Vilcabamba, 12° 35' S, 73° 35' W, elev. 2510-2568 m: Dudley 10695 and 10698; Madison 10150) almost completely lack simple leaf hairs (occasionally a very few at the extreme blade base beneath). The species seems to be dioecious, the Jameson type (isotype US) as well as Weberbauer 1145 being female with expanded stigmas and abortive anthers; most (or all) of the other collections are male, with well-developed anthers, unexpanded and non-exserted stigmas, and abortive ovaries. A recent (male) Ecuadorian collection is Maguire & Maguire 44367 (NY, US).

MICONIA RUGIFOLIA Triana

Cogniaux had placed this species in Sect. Amblyarrhena. Actually M. rugifolia is very closely related to M. micropetala (vide supra), differing in the bullate-rugose upper leaf surfaces and slightly larger flowers (petals ca. 1.7-1.8 X 0.9-1 mm, rather than 0.8-1.1 X 0.6-0.7 mm). The two species share the features of dioecism (Lechler 2196 [K] and Dudley 10705 being female), 2-pored anthers, and ovary apices with well-developed flanges to the hypanthial wall. Several recent Cuzco collections (Pontiacolla, Vargas 19863; Cordillera Vilcabamba, 12° 35' S, 73° 35' W, elev. 2510-2750 m, Dudley 10907 and 10705) have been referred to M. rugifolia, although the leaf blades are relatively wider than in Lechler 2196; here also perhaps belong Madison 10102 (Cordillera Vilcabamba, Cuzco, elev. 1730 m, fruiting), with less densely bullate leaf blades, and Wolfe 12427 (Cerro de Sira, Huánuco, elev. 1880 m, sterile).

MICONIA CAERULEA (D. Don) Naud. subsp. VILCABAMBAE Wurdack, subsp. nov.

Ramulorum pili appressi ascendentes ca. 0.8 mm longi. Foliorum superficies supra sparsissime strigulosae (pilis ca. 0.3-0.5 mm longis) subtus sparse strigulosae (pilis ca. 0.8-1 mm longis). Inflorescentiae rami ramulique sparse appresso-

setulosi pilis ca. 0.6-0.8 mm longis. Calyx extus non setulosus.

Type Collection: T. R. Dudley 10421 (holotype US 2626776; isotype NA), collected in montane rainforest between Camps 2 1/2 and 3 ca. 13 km NE from Hacienda Luisiana and Río Apurímac, Cordillera Vilcabamba, Prov. Convención, Depto. Cuzco, Peru, 12° 35' S, 73° 35' W, elev. 1460-1730 m, 24 June 1968. "Shrub 6-30 ft., DBH 1/4-1 1/2 in. Flowers white and fragrant. Common."

Paratype (same general region): M. T. Madison 10125 (NA, US), from below Camp 2 1/2, elev. ca. 1622 m.

The typical subspecies has branchlets and inflorescence densely setulose with somewhat reflexed hairs 1-1.5 mm long, leaf blades above sparsely to moderately loose-strigulose and below moderately appressed-setulose, and calyx sparsely fine-setulose at the toral zone outside. The type of M. caerulea is female, a good recent match (male) being Vargas 3434 (US) from Amaibamba-Ceilan, Cuzco. Both collections of subsp. vilcabambae are male. Killip & Smith 24758 (US), from San Ramon, Junín, is somewhat intermediate between subsp. caerulea and subsp. vilcabambae, with the patent cauline and inflorescence pubescence and lower leaf surface hairs of the typical subspecies but with trichome density attenuated. The cauline and inflorescence hairs of M. caerulea are smooth and in part caducously and inconspicuously gland-tipped.

MICONIA DASYCLADA Wurdack, sp. nov.

Sect. Cremanium. M. caeruleae (D. Don) Naud. affinis, ramulorum pilis sparse barbellatis folia subtus in superficie glabra differt.

Ramuli sulcato-quadrangulati demum teretes densiuscule pilis sparse barbellatis gracilibus paulo reflexis ca. 2 mm longis p. p. inconspicue glanduliferis armati et glandulis 0.03-0.05 mm longis obsiti. Petioli 1-2(-3.5) cm longi; lamina 9-15(-18.5) X 3.5-7(-8) cm oblongo-elliptica apice breviter (1-2 cm) gradatimque acuminato basi rotundata, membranacea et integra, breviter (ca. 0.5 mm) distanterque appresso-ciliolata, supra sparsissime strigulosa pilis 0.3-0.5 mm longis, subtus in venis primariis secundariisque sparse pilis gracilibus laevibus 0.2-0.7 mm longis sparsiuscule induti in superficie glabra, 3-nervata (pari exteriore inframarginali tenui neglecto) nervis secundariis ca. 4 mm inter se distantibus venulis subtus planis laxe reticulatis (areolis ca. 0.8 mm latis). Panicula 8-11 X 7-13 cm multiflora, ramulis modice setulosis pilis laevibus vel sparsissime barbellatis 1-2 mm longis p. p. glanduliferis; flores 5-meri essentialiter sessiles (pedicellis ca. 0.2 mm longis) in ramulis interrupto-glomerulati, bracteolis ca. 0.8 mm longis subulatis persistentibus. Hypanthium (ad torum) 1.4-1.6 mm longum glandulis ca. 0.05 mm longis modice obsitum alioqui glabrum vel sparsissime setulosum; calycis tubus 0.1 mm longus, lobis interioribus 0.4 mm longis oblongis, dentibus exterioribus acutis non eminentibus. Petala 0.8 X 0.6-0.7 mm obovata minutissime granulosa. Flores masculini ignoti; stamina in

floribus femineis sterilia, filamentis 1.1-1.2 mm longis glabris, thecis 0.3-0.4 X 0.2-0.4 mm late obovatis, connectivo paullulo (0.1 mm) prolongato non expanso. Stigma in floribus femineis peltatum 0.8-0.9 mm diam.; stylus 3.3 X 0.3 mm sparse pilis glanduliferis 0.05-0.1 mm longis puberulus; ovarium 3-loculare et 0.8 inferum, apice conico 0.2 mm alto sparse pilis 0.1 mm longis setuloso.

Type Collection: T. R. Dudley 11829 (holotype US 2626773; isotype NA), collected just below campsite at Huanhuachayo ca. 25 km SW of Hacienda Luisiana and Río Apurímac, eastern Massif of Cordillera Central opposite Cordillera Vilcabamba, Prov. La Mar, Depto. Ayacucho, Peru, 12° 43' S, 73° 50' W, elev. ca. 1570 m, 18 Aug. 1968. "Shrub or small tree 15-20 ft. Inflorescence branches pinkish."

Paratypes: M. T. Madison 10097 (NA, US, in young bud) and T. R. Dudley 10378 (NA, sterile), both from Camp 2 1/2, Cordillera Vilcabamba, Prov. Convención, Depto. Cuzco, Peru, ca. 12° 38' S, 73° 38' W, elev. ca. 1730 m.

Miconia caerulea has smooth trichomes throughout and leaves beneath evenly appressed-setulose with hairs ca. 1 mm long. Miconia dasyclada is rather a bridge to the species of Sect. Cremanium with densely roughened pubescence and does not seem intimately related to M. brachyanthera Triana nor M. peruviana Cogn. From the description and type photograph, M. herzogii Cogn. of Bolivia differs at least in the densely stellate-furfuraceous branchlets (Gleason's notes indicating pinoid hairs ca. 0.3 mm long) and relatively broader acute-based leaf blades. As seems true also in both M. caerulea and M. cyanocarpa Naud., M. dasyclada is dioecious, the type collection being female.

MICONIA POLYCHAETA Wurdack, sp. nov.

Sect. Cremanium. M. polygamae Cogn. affinis, foliis proportionaliter angustioribus pilis subtus (venis primariis exceptis) simplicibus bracteolis latioribus calycis lobis distincte evolutis extus sparse setulosus differt.

Frutex vel arbor. Ramuli paulo nodosi obtuse sulcato-quadrangulati demum teretes densiuscule glandulis ca. 0.05 mm longis induti; nodi sicut petioli foliorum subtus venae primariae inflorescentiarum ramique dense pilis stipitato-stellulatis (stipite 0.3-1 mm longo, radiis gracillimis) obsiti. Petioli (1-)2-3(-4) cm longi; lamina 7-18(-23) X 3-6(-9) cm elliptico-oblonga apice acuminato basi obtusa vel rotundata, membranacea et irregulariter ciliolata-serrulata, utrinque sparsiuscule pilis laevibus gracilibus laxiusculis ca. 1 mm longis induta, (3-)5-nervata vel paulo (usque ad 0.4 cm) plinervata nervis secundariis ca. 4-5 mm inter se distantibus venulis subtus planis laxe reticulatis areolis ca. 0.8 mm latis. Panicula ca. 8 cm longa multiflora; flores 5-meri subsessiles (pedicellis ca. 0.2-0.3 mm longis), bracteolis ca. 1-1.2 X 0.2-0.3 mm oblanceatis ciliolatis usque ad anthesim persistentibus. Hypanthium (ad torum) ca. 1.5 mm longum extus sparse glandulis minutis obsitum alioqui glabrum; calycis tubus 0.2 mm altus,

lobis interioribus 0.2-0.4 mm longis dentibus exterioribus crassis sparse setulosis paullulo eminentibus. Petala 1.5 X 0.9-1 mm oblongo-obovata glabra. Stamina fertilia (in floribus masculinis) paullulo dimorphica glabra; filamenta 2.4-2.5 mm longa; thecae 1-1.1 mm longae 4-loculares late incompleteque 4-porosae, connectivo 0.25-0.3 mm prolongato paullulo expanso. Pistillum in floribus masculinis abortivum, stigmatibus punctiformi, stylo ca. 0.3 mm longo; ovarium fertile (in floribus femineis) 3-loculare, apice conico glabro, stylo glabro, stigmatibus expanso ca. 0.4 mm lato.

Type Collection: T. R. Dudley 10430 (holotype US 2626777, male; isotype NA), collected in cloud forest between Camps 2 1/2 and 3 ca. 15 km NE from Hacienda Luisiana and Río Apurímac, Cordillera Vilcabamba, Prov. Convención, Depto. Cuzco, Peru, 12° 35' S, 73° 35' W, elev. 1730-2000 m, 24 June 1968. "Multiple-trunked tree 10-40 ft., DBH 2-6 in.; leaf indument red to brownish."

Paratypes (all Peru): San Martín: R. Ferreyra 1024 (US; male), from Margarita, Divisoria. Cuzco (all near-topotypical): M. T. Madison 10184 (NA, US; female, in bud), from near Camp 2, elev. 1565 m; Madison 10179 (NA; male) and 10112 (NA, US; in very young bud), Dudley 10380 (NA; sterile) and 10626 (NA; male), all from near Camp 2 1/2, elev. 1622-1730 m.

Miconia polygama has leaf blades ca. 1.5 (rather than 2.5-3) times as long as wide with all the hairs beneath stipitate-stellate and the simple hairs above denser and somewhat shorter, setiform bracteoles, and barely evolved esetulose calyx lobes; M. vitiflora Macbride has relatively wider leaf blades glabrous above and with only roughened pubescence beneath, as well as glabrous calyces. In anther form, M. polychaeta is like M. paradisica Wurdack, which however has different vegetative features. The general vegetative facies, but not the reproductive features, of M. polychaeta is rather like that of M. erioclada Triana (Sect. Miconia).

MICONIA THAMINANTHA Wurdack, sp. nov.

Sect. Cremanium. M. apricae Gleason affinis, foliis supra essentialiter glabris differt.

Frutex vel arbor parva (1-)2-9(-18) m. Ramuli primum obtuse quadrangulati demum teretes paulo nodosi in petiolorum insertionibus ca. 0.5-1 mm callose elevati et caduce barbellato-setulosi sicut petioli foliorum subtus venae primariae inflorescentiaque pilis irregulariter stipitato-stellatis ca. 0.3-0.5 mm longis laxissimis (ut videtur arachnoideis) sparsiuscule vel modice puberuli. Petioli 0.8-1.5 cm longi; lamina (6-)8-13 X (2)3-4(-5) cm oblongo-elliptica apice gradatim breviterque acuminate basi rotundata, firme membranacea et integra vel obscure serrulata, supra in superficie glabra (vel in zona 1 mm inframarginali sparse obscureque scabrido-strigulosa pilis crassis ca. 0.1-0.2 mm longis), subtus in superficie glabra et epunctata in venulis sparse glandulis 0.03 mm longis sparse induta, 3-nervata (pari exteriori tenui inframarginali neglecto)

nervis secundariis ca. 2-3 mm inter se distantibus nervulis subtus planis areolis ca. 0.5 mm latis. Panicula (3.5-)6-9 cm longa submultiflora, ramis primariis oppositis; flores 5-meri subsessiles (pedicellis 0.2-0.5 mm longis) glomerati, bracteolis ca. 1.2-1.5 X 0.3 mm oblongis ciliolatis persistentibus. Hypanthium (ad torum) 1.3-1.5 mm longum sparse glandulis minutis indutum alioqui glabrum; calycis tubus 0.1-0.2 mm altus, lobis interioribus 0.4 mm longis semicircularibus, dentibus exterioribus crassis non eminentibus interdum setulis 1-3 brevibus ornatis. Petala 1.3-1.4 X 0.8-1 mm obovato-oblonga retusa glabra. Flores masculini: stamina paullulo dimorphica glabra; filamenta 2-2.1 mm longa; thecae 0.8-1 X 0.4 X 0.5 mm oblongae late (0.25-0.35 mm) biporosae, connectivo ca. 0.2-0.25 mm prolongato crasso; ovarium abortivum, cono ca. 0.4 mm alto, stylo 0.2 mm longo incluso, stigmatibus punctiformi. Flores feminei: stamina sterilia, filamentis 1.5-1.7 mm longis, thecis ca. 0.7 X 0.2 X 0.2 mm, connectivo ca. 0.2 mm prolongato; stigma capitellatum 0.5 mm diam.; stylus 2.3 X 0.15 mm glaber; ovarium 3-loculare et 2/3 inferum, apice truncato-conico 0.4 mm alto glabro.

MICONIA THAMINANATHA Wurdack subsp. *THAMINANATHA*

Foliorum subtus venulae sparse pilis 0.2-0.4 mm longis simplicibus indutae; foliorum cilia marginalia 0.1 mm longa caduca, marginibus ut videtur minute crenulatis.

Type Collection: T. R. Dudley 10531 (holotype US 2626816, male; isotype NA), collected in cloudforest just below Camp 3 ca. 15 km NE from Hacienda Luisiana and Río Apurimac, Cordillera Vilcabamba, Prov. Convención, Depto. Cuzco, 12° 30' S, 73° 30' W, elev. ca. 2000 m, 26 June 1968. "Slender tree 10-30 ft. tall; leaves brownish below. Flowers creamy white. Common and weedy locally."

Paratypes (all near-topotypical): T. R. Dudley 10677 (NA, fruiting), from Camp 2, elev. 1460 m; M. T. Madison 10136 (NA, male; elev. 1892 m), T. R. Dudley 10341 (NA, US, female; elev. 1730-2000 m), 10344 (NA, US, female; elev. 1730-2000 m), and 10541 (NA, male; elev. ca. 2000 m), all from between Camps 2 1/2 and 3.

MICONIA THAMINANATHA subsp. *HUANUCENSIS* Wurdack, subsp. nov.

Foliorum subtus venulae esetulosae; foliorum cilia marginalia 0.2-0.3 mm longa persistentia, marginibus ut videtur serrulatis.

Type Collection: T. R. Dudley 13187 (holotype US 2658939, male), collected in dense cloud forest between Camp 3 and Camp 4, southwestern slope of the Río Lluçhichis watershed on the ascent of the Cerros del Sira, Depto. Huánuco, Peru, 10° 26' S, 74° 45' W, elev. 1450 m, 23 July 1969. "Many-stemmed shrub 8 ft. tall. Flowers white."

Paratypes (all near-topotypical): F. Wolfe 12362 (NA, US, male?, in young bud), T. R. Dudley 13226 (NA, US, in very young bud) and 13225 (NA, US, fruiting), all from near Camp 3, elev. 1280-1290 m.

Miconia aprica has leaf blades above sparsely asperous-

strigulose with stout hairs, marginally more obviously ciliate, and beneath sparsely punctulate on the actual surface, as well as cauline hairs irregularly stipitate-stellate (and with a more robust stalk) and more developed styles in the male flowers; in other floral details, the two species are very similar.

Miconia peruviana Cogn., with leaves strigulose above, shorter pinoid pubescence on the leaves beneath, and primary inflorescence branches 4 per node, is another relative (and very similar to M. aprica); a recent collection (female, in flower) matching well Lechler 2066 (K) is Vargas 6872, from Ollachea, Carabaya, Puno. Both M. aprica and M. peruviana are dioecious; the type collection of M. aprica is male (as is also Soukup 3426), female collections (with abortive anthers and expanded stigmas) being Ferreya 3639, Killip & Smith 24316 and 24381, all from Junín. Miconia galactantha Naud. (isotype FI) differs at least in the more closely serrulate leaf blades which are very sparsely scurfy on the veins beneath, as well as the essentially glabrous inflorescences and setuliform (ca. 0.3 mm long) early-caducous bracteoles. Miconia saxatilis Macbride differs at least in the sharply quadrate branchlets and larger plinerved basally acute leaf blades; M. coelestis (Don) Naud., M. crassistigma Cogn. (with longer pedicels), and M. brevistylis Cogn. all have leaf blades punctulate on the surface beneath and less thickened anther connectives.

Miconia lugubris Cogn. (also, more distantly, M. atrofusca Cogn.) is related to the M. aprica-M. thaminantha alliance, but with smaller leaves and more abundantly setulose calyces. A relative of M. lugubris (in young bud; with much sparser simple hairs on both sides of the leaves) has been collected on the summit (elev. 2200 m) of the Cerros del Sira in Huánuco (Wolfe 12430, 12443); collections at anthesis are needed for description. Previously I referred Asplund 13125 (S, US), from Carpish, Huánuco, to M. lugubris, but this collection essentially lacks the dense simple hairs on the lower leaf surfaces and is at least subspecifically distinct (but not the same as M. thaminantha subsp. huanucensis).

MICONIA RUFIRAMEA Wurdack, sp. nov.

M. dumetosae Cogn. affinis, ramulorum pubescentia longiore foliis proportionaliter latioribus ad basim rotundatis differt.

Ramuli obtuse tetragoni demum teretes sicut petioli inflorescentiae axis densissime pilis minutissime densequae barbellatis 0.5-1.2 mm longis patentibus armati. Petioli 0.3-0.5 cm longi; lamina 1.8-2.7(-3.8) X 1.3-2(-2.7) cm, late elliptica vel paullulo ovato-elliptica apice late acuto vel brevissime (usque ad 0.3 cm) subabrupteque acuminato basi rotundata, rigide coriacea (marginibus plerumque recurvis) et obscure distanterque ciliolato-serrulata (ciliis crassis appressis 0.1-0.2 mm longis), supra glabra et paulo rugosa, subtus in venis primariis sparse caduceque pinoideo-furfuracea (pilis ca. 0.1-0.2 mm longis) et in venulis superficiei sparsiuscule glandulis minutis 0.02 mm longis obsita alioqui glabra, 3-nervata nervis secundariis ca.

2 mm inter se distantibus sicut venulis supra insculptis nervulis subtus planis areolis plerumque 0.6-0.9 mm latis. Panicula 2.5-4 X 2-3 cm submultiflora, ramulis oppositis sparsiuscule pinoideo-furfuraceis (pilis 0.1-0.2 mm longis); flores 5-meri breviter (in fructibus 0.5-1 mm) pedicellati, bracteolis 0.3-0.5 X 0.1 mm valde caducis. Hypanthium sparse glandulis minutis obsitum alioqui glabrum. Petala immatura minuta glabra. Antherarum thecae immaturae ca. 0.6-0.65 X 0.4-0.45 mm oblongo-ovoideae incomplete 4-loculares ut videtur biporosae, connectivo paulo (immaturo ca. 0.2 mm) prolongato. Fructus ca. 2.5 X 2.5 mm, calycis lobis interioribus 0.4 mm longis, dentibus exterioribus crassis lobos interiores aequantibus, ovarii apice glandulis paucis ornato.

Type Collection: T. R. Dudley 10919 (holotype US 2626810, in young bud, male?; isotype NA), collected just below Camp 5 ca. 23 km NE from Hacienda Luisiana and Río Apurímac, Cordillera Vilcabamba, Prov. Convención, Depto. Cuzco, Peru, 12° 35' S, 73° 35' W, elev. ca. 2750 m, 10 July 1968. "Dense shrub to 8 ft.; leaves dark green, glossy above, cucullate; stem indument rufous-tomentose. Flowers whitish yellow."

Paratypes (near-topotypical): M. T. Madison 10152 (NA, US), from Camp 4, elev. ca. 2663 m (fruiting); T. R. Dudley 11143 (NA, US), from below Camp 6, elev. ca. 3000 m (fruiting).

Miconia dumetosa has rather scurfy-pinoid cauline pubescence 0.1-0.3 mm long and acute-based leaf blades with length/width ratio 2.2-2.9 (rather than 1.5-1.7). Vegetatively M. rufiramea rather resembles M. secundifolia Cogn. subsp. malcabalensis Wurdack, which has thicker clavate cauline hairs 0.2-0.3 mm long and much larger bisexual flowers with pinoid-puberulous hypanthia.

MICONIA AYACUCHENSIS Wurdack, sp. nov.

Sect. Cremanium. M. cremophyllae Naud. affinis, foliorum ciliis longioribus floribus maioribus differt.

Ramuli obtuse sulcato-quadrangulati demum teretes in nodis linea interpetiolarum paullulo (0.2 mm) elevata armati sicut folia subtus inflorescentia hypanthiaque sparse glanduloso-punctati alioqui glabri. Petioli 0.8-1(-2.5) cm longi; lamina 5-6.5(-9.5) X 2.2-3.3(-4.7) cm elliptica vel oblongo-elliptica apice acuto vel paulo (ad 0.5 cm) subgradatimque acuminato basi late acuta, coriacea et integra, conspicue appresso-ciliata ciliis 1-2 mm longis, 3-nervata nervis secundariis plerumque 3-4 mm inter se distantibus nervulis subtus planis laxiuscule reticulatis (areolis ca. 1 mm latis). Panicula ca. 5 X 3 cm submultiflora; flores 5-meri, pedicellis crassis 1.5-2 mm longis, bracteolis ca. 0.7 X 0.1 mm valde caducis. Hypanthium (ad torum) 3.7 mm longum; calycis tubus 0.7 mm altus, lobis interioribus oblongo-triangularibus 1 mm longis, dentibus exterioribus crassis inframarginalibus. Petala 2.5-2.6 X 2.2 mm obovato-oblonga extus glabra intus minutissime granulosa. Stamina paullulo dimorphica glabra; filamenta 2.7-2.8 mm longa; antherarum thecae 1.7-1.8 X 0.6 X 0.8 mm late biporosae;

connectivum 0.7-1 mm prolongatum ad basim dorsaliter dente hebeti vel paullulo (0.15 mm) bilobulato et ventraliter appendice 0.2-0.3 mm bilobulato armatum. Stigma expansum 1 mm diam.; stylus 4 X 0.65 mm glaber in ovarii apicem ca. 0.6 mm immersus; ovarium 3-loculare et $2/3$ - $3/4$ inferum, apice conico 1 mm alto sparsissime glandulis 0.1 mm longis coronato.

Type Collection: T. R. Dudley 11992 (holotype US 2658938), collected above timberline above Punccu campsite ca. 50 km SW from Hacienda Luisiana and Río Apurimac, eastern Massif of the Cordillera Central opposite Cordillera Vilcabamba, Prov. La Mar, Depto. Ayacucho, Peru, ca. $12^{\circ} 45' S$, $73^{\circ} 53' W$, elev. 3400-3600 m, 23 Aug. 1968. "Dense rounded shrub; calyx red; petals white; fruit purple."

Paratype (near-topotypical): J. W. Terborgh 10381 (NA, sterile), from elfin forest near Punccu, elev. 3380 m.

Miconia cremophylla has somewhat larger leaf blades with margin ciliation only ca. 0.2 mm long, as well as considerably smaller (hypanthium ca. 2 mm long, petals 1.8-2 X 1.6-1.8 mm, anther thecae 1.3-1.5 mm long) subsessile flowers with barely (0.1-0.15 mm) appendaged anthers. Other already-described relatives include M. towarensis Cogn. and M. turgida Gleason (cf. *Phytologia* 22: 409. 1972), as well as (more distantly) M. coelestis (Don) Naud. and M. malatestae Macbride (both with much larger leaf blades with shorter cilia).

MICONIA VARGASII Wurdack, sp. nov.

Sect. Cremanium. M. ayacuchensi Wurdack affinis, floribus minoribus calycis dentibus exterioribus eminentibus differt.

Ramuli obtuse sulcato-quadrangulati demum teretes in nodis linea interpetiolarum crassa 0.2-0.3 mm elevata armati sicut folia subtus inflorescentia hypanthiaque sparse glanduloso-punctata alioqui glabri. Petioli 0.7-1.7 cm longi; lamina 4-9.5 X 1.8-4.5 cm elliptica vel oblongo-elliptica apice hebeti-acuto basi acuta vel obtusa, coriacea et integrâ, appressociliata ciliis 1-1.8 mm longis, 3-nervata nervis secundariis plerumque 2-3 mm inter se distantibus nervulis subtus planis laxiuscule reticulatis (areolis ca. 1 mm latis). Panicula 6-8 X 3-4 cm submultiflora; flores 5-meri, pedicellis 1.7-2.5 mm longis, bracteolis ca. 1-2 X 0.1-0.3 mm fimbriato-ciliolatis mox caducis. Hypanthium (ad torum) 3 mm longum; calycis tubus 0.5 mm altus, lobis interioribus 0.6-0.8 mm altis ovatis, dentibus exterioribus crassis 0.2-0.5 mm eminentibus. Petala 1.9-2 X 1.3-1.4 mm obovato-oblonga ubique minutissime granulosa. Stamina paulo dimorphica glabra; filamenta 1.8-2.2 mm longa; antherarum thecae 1-1.1 X 0.4-0.45 X 0.5-0.6 mm paulo curvatae late (0.35-0.4 mm) biporosae; connectivum 0.35-0.7 mm prolongatum dorsaliter dente hebeti vel acuto et ventraliter appendice paulo bilobulato armatum. Stigma capitellatum 1.2-1.3 mm diam.; stylus 5 X 0.5 mm glaber in ovarii apicem 0.4-0.7 mm immersus; ovarium 3-loculare et $2/3$ - $3/4$ inferum, apice conico 0.6-1 mm alto sparse glandulis 0.1 mm longis coronato.

Type Collection: C. Vargas 2942 (holotype US 1830121),

collected at "Puyupatamarca," Prov. Urubamba, Depto. Cuzco, Peru, elev. 3400 m, 6 Aug. 1947. "Arbusto 3-4 m; pétalos blancos."

Paratype: R. D. Metcalf 30774 (US), from near Wenner Gren ruins, Prov. Urubamba, Depto. Cuzco, Peru, elev. 3400-3600 m.

Miconia ayacuchensis has considerably larger flowers with inframarginal external calyx teeth, but similar leaf ciliation and anther connectives. The other relatives discussed under M. ayacuchensis (vide supra) all have shorter leaf ciliation and non-projecting external calyx teeth. Vargas 2942 was distributed as M. alpina Cogn. and Metcalf 30774 as M. andina Naud. (a synonym of M. latifolia [Don] Naud.); both these are 4-merous species of Sect. Chaenopleura. The type and paratype localities for M. vargasii are in the group of Inca ruins just south of Machu Picchu (Fejos, P. Archaeological Exploration in the Cordillera Vilcabamba southeastern Peru. Viking Fund Publ. Anthropol. 3. 1944; Vargas, C. Homenaje Botánico a Machu Picchu. Rev. Mus. Inst. Arq. 19. 1961).

MICONIA CHORIOPHYLLA Wurdack, sp. nov.

Sect. Cremanium. M. brevistylae Cogn. affinis, foliis tenuioribus petiolis gracillimis floribus bene pedicellatis differt.

Ramuli teretes sicut folia inflorescentiaque primum sparse vel modice resinoso-granulosi glabrati alioqui glabri. Petioli 1-2.5 cm longi, ca. 0.7-0.9 mm diam.; lamina oblongo-lanceata vel oblongo-elliptica apice gradatim vel subgradatim per 1-1.5 (-2) cm acuminato basi acuta vel obtusa, membranacea et integra, obscure (0.05 mm) distanterque appresso-ciliolata, 3-nervata vel inconspicue (ad 0.2 cm) 3-plinervata nervis secundariis 2-3 mm inter se distantibus nervulis subtus planis laxiuscule reticulatis (areolis ca. 0.5-0.7 mm latis). Panicula 3-12 X 3-9 cm submultiflora vel multiflora, ramis oppositis divaricatis quadrangularibus gracilibus; flores 5-meri unisexuales, pedicellis 0.5-1(-1.5) mm longis juxta hypanthii basim vel paullulo infra articulatis, bracteolis ca. 0.7 X 0.1-0.15 mm mox caducis. Hypanthium (ad torum) 0.9-1.5 mm longum extus sparse granuloso-resinosum; calycis tubus 0.15-0.2 mm longus, lobis interioribus 0.1-0.15(-0.2) mm altis inconspicuis, dentibus exterioribus subobsoletis inframarginalibus. Petala 0.8-1 X 0.7-0.9 mm suborbicularia vel obovato-suborbicularia apicem versus paullulo erosula inconspicue granulosa. Flores masculini: stamina paullulo dimorphica glabra; filamenta 1-1.2 mm longa; thecae 0.6 X 0.35-0.45 mm obovato-oblongae late biporosae incomplete 4-loculares, connectivo 0.2-0.4 mm prolongato angusto; stigma non expansum; stylus ca. 0.4 mm longus inclusus; ovarium abortivum. Flores feminei: stamina abortiva, filamentis 1.2 mm longis, thecis 0.35-0.4 X 0.2 mm, connectivo 0.3 mm prolongato; stigma capitellatum 0.7-0.8 mm diam.; stylus 2.6 X 0.35 mm glaber exsertus in ovarii apicem 0.1-0.2 mm immersus; ovarium 3-loculare et 2/3 inferum, apice glabro alis 5 cum hypanthii pariete connexo.

MICONIA CHORIOPHYLLA var. *CHORIOPHYLLA*

Foliorum lamina plerumque 8.5-14.5 X 1.7-3(-3.8) cm.

Linea interpetiolaris non evoluta.

Type Collection: T. R. Dudley 10405 (holotype US 2626786, male; isotype NA), collected in cloud forest at Camp 2 ca. 10 km NE of Hacienda Luisiana and Río Apurimac, Cordillera Vilcabamba, Prov. Convención, Depto. Cuzco, Peru, 12° 30' S, 73° 30' W, elev. 1460 m, 24 June 1968. "Shrub 6-15 ft. tall; petioles and venation on upper leaf surface reddish. Flowers white."

Paratypes (all Peru): Cuzco (near-topotypical): T. R. Dudley 10433 (NA, US, male), M. T. Madison 10191 (NA, sterile) and 10192 (NA, male), all from near Camp 2; T. R. Dudley 10613 (NA, sterile) and 10388 (NA, sterile), Madison 10111 (NA, sterile), all from Camp 2 1/2, elev. 1730 m; T. R. Dudley 10370 (NA, US, male in bud), 10445 (NA, US, female in flower), 10540 (NA, fruiting), all from between Camps 2 1/2 and 3, elev. 1900-2000 m. Ayacucho (Prov. La Mar, Cordillera Central opposite Cordillera Vilcabamba): T. R. Dudley 11828 (NA, US, fruiting), from Huanhuachayo, elev. 1570 m; T. R. Dudley 11918 (NA, male), from between Huanhuachayo and Puncu, ca. 12° 45' S, 73° 53' W.

MICONIA CHORIOPHYLLA var. *BREVIFOLIA* Wurdack, var. nov.

Foliorum lamina plerumque 4.5-6(-7) X 1.8-2.5 cm. Linea interpetiolaris obscure evoluta.

Type Collection: T. R. Dudley 13520 (holotype US 2626791, male; isotype NA), collected in open elfin forest between Camps 4 and 5, southwestern slope of Río LlullaPichis watershed on ascent of Cerros del Sira, Depto. Huánuco, Peru, 9° 25' S, 74° 44' W, elev. 1680 m, 31 July 1969. "Dense shrub ca. 6 ft. tall. Inflorescence and flower buds deep purple."

Miconia brevistyla has firmer leaf blades with appressed cilia 0.2-0.3 mm long and sparse inconspicuously barbellate hairs 0.2-0.3 mm long basally along the costa beneath, as well as subsessile (pedicels 0.1-0.2 mm long) flowers. The type collection of M. brevistyla is male and the species may yet prove synonymous with M. coelestis (Don) Naud. (type collection female). Another relative is M. elongata Cogn. (type collection female), with quadrangular branchlets, much firmer and shortly plinerved leaf blades on stouter petioles, somewhat larger hypanthia, and more distinctly (ca. 0.3 mm) lobed calyx; to M. elongata I have referred several recent Peruvian collections (Puno: Vargas 14825. Cuzco: Vargas 6235 and 14914). Cogniaux originally placed M. elongata in Sect. Amblyarrhena, but the type clearly indicates placement with other dioecious species of Sect. Cremanium. Miconia choriophylla also generally resembles M. glaberrima (Schlecht.) Triana var. australis Macbride, which differs from both the new varieties at least in the longer furfuraceous indument along the primary leaf veins beneath (paratype US, with galled inflorescences); I doubt that Macbride's variety is conspecific with the Central American species and indeed the La Merced population may well be includable in M. choriophylla (subspecifically distinct), but detailed

examination of Macbride 5769 is needed. One somewhat anomalous collection (Dudley 10457, female; material incomplete) has not been included in the paratypes of M. choriophylla, having foliage as in var. choriophylla (and collected at the same locality as Dudley 10445) but with interpetiolar cauline lines developed and calyx more lobed than typical.

MICONIA LACHNOCLADA Wurdack, sp. nov.

M. bullatae (Turcz.) Triana affinis, foliis maioribus distincte 5-nervatis inflorescentia multiflora filamentis glabris ovarii apice glabro differt.

Ramuli sicut petioli (apicem versus) pilis patentibus minutissime barbellatis 2-3 mm longis sparse induti et sicut petioli inflorescentiae pedunculusque pilis dense barbellatis 1-1.5 mm longis patentibus dense armati. Petioli (0.4-)0.7-1.2 cm longi; lamina (2.2-)3-5.7 X (1.3-)2-3.7 cm ovato-oblonga vel elliptica apice late acuto basi late obtusa, rigida et minute serrulata (dentibus ca. 0.2 mm calloso-ciliolatis), supra bullata bullis mucro crasso ca. 0.2 mm longo armatis alioqui glabra, subtus in venis primariis secundariisque modice pilis barbellatis crispulis ca. 1 mm longis et in venis primariis densiuscule pilis pinoideis ca. 0.2 mm longis induta, 5-nervata nervis secundariis ca. 2 mm inter se distantibus nervulis subtus planis densiuscule reticulatis (areolis ca. 0.3 mm latis). Panicula 3-5 cm longa multiflora terminalis, ramulis modice pilis pinoideis ca. 0.3 mm longis armatis; flores 4-meri, pedicellis 1.2-1.7 mm longis, bracteolis angustis ca. 0.5 mm longis mox caducis. Hypanthium (ad torum) 2.5 mm longum extus sparse stellulato-puberulum et minutissime glandulosum; calycis tubus 0.2-0.3 mm altus, limbo paullulo (0.35 mm) 4-undulato, dentibus exterioribus crassis non eminentibus. Petala 1.7-1.8 X 2.3 mm late obovata paulo retusa minute granulosa. Stamina isomorphica glabra; filamenta 1.9-2 mm longa, basim versus 0.8 mm lata; thecae 1.5 X 1.1 X 0.8 mm obovatae late biporosae et 0.3 mm emarginatae, connectivo ad apicem 0.1-0.2 mm eminenti ad basim dorsaliter 0.15 mm hebeti-dentato ventraliter paulo (0.15 mm) bilobulato-prolongato. Stigma capitatum 0.9 mm diam., 0.5 mm altum; stylus 2.3 X 0.5 mm glaber in ovarii apicem ca. 0.2 mm immersus; ovarium 4-loculare et 0.8 inferum, apice truncato-conico 0.4 mm alto glabro.

Type Collection: M. T. Madison 10378 (holotype US 2626800; isotype NA), collected in full sun along trail near Cusimachay ca. 25 km NE of Tambo on west slope of Río Apurímac valley, Prov. La Mar, Depto. Ayacucho, Peru, 12° 49' S, 73° 50' W, elev. ca. 3587 m, 28 July 1970. "Tree 4 m tall, with dense crown; leaves stiff, dull dark green, rugose, with scarlet-tipped hairs below. Calyx light green; corolla and stamens pale lemony-white."

Miconia bullata has 3-nerved leaf blades only up to 2.4 X 1.8 cm (usually smaller) with short (ca. 0.1 mm long) sparse ~~pinoid hairs~~ on the primary veins beneath (as well as longer simple hairs), inflorescences mostly 3-5-flowered, glabrous (except for the sparse glands) hypanthia, sparsely (especially apically)

glandular filaments, and sparsely glandular-setulose ovary apices; apart from the collections listed in the synonymization of M. trichocaula Macbride (Phytologia 11: 395. 1965), M. bullata is now known from Huancavelica, Peru (Huachocolpa-Marcavalla, elev. 3000-3200 m, Q. Tovar 4046). Miconia miles-morganii Macbride is more distantly related, having only short (0.1-0.2 mm long) pinoid vegetative pubescence, longer and relatively narrower anthers, and sparsely glandular-setulose ovary apices (but 4-merous flowers, despite the original description). The type collection of M. miles-morganii (isotype US) shows styles sparsely glandular-puberulous as well as stellulate-puberulous; a more northern population of this species (Hutchison & Wright 5595 and Lopez, Sagastegui, & Collantes 4438, both from Cerros Calla-Calla, Amazonas) shows styles without stellulate hairs (very sparsely glandular), but otherwise does not differ from the Huanuco material.

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BOOK REVIEWS

Alma L. Moldenke

"BEEKEEPING - THE GENTLE CRAFT" by John F. Adams, 182 pp., illus., Doubleday & Co., Garden City, New York 11530. \$5.95.

This is so enthusiastically and delightfully written a guide for the amateur beekeeper that non-bee-raising readers like myself find or will find themselves musing about watching these fascinating creatures at their highly diversified labors and about enjoying their delicious product first-hand. For the apiary hobbyist there is much valuable guidance in this book. There is a useful bibliography that is interestingly annotated.

"PHOTOSYNTHESIS : METHODS IN ENZYMOLOGY Volume XXIII Part A" edited by Anthony San Pietro with editors-in-chief Sidney P. Colowick & Nathan O. Kaplan, xix & 743 pp., illus., Academic Press, London & New York, N. Y. 10003. 1971. \$29.50.

The editor's short preface gives a good idea of the nature of this book: "The discovery of the chloroplast reaction by Hill in 1937, commonly known as the Hill reaction, heralded the concerted enzymological attack on the mechanism of photosynthesis. In the ensuing three and a half decades, a tremendous but diverse wealth of knowledge has accumulated from the multiplicity of experimental approaches used to study this problem. The aim of this (and the succeeding) volume is to provide as comprehensive as possible a coverage of these methodological approaches, namely, biochemical, biophysical, genetic, and physiological.

"The presentations in this volume consider isolation and cul-

ture techniques of algae, bacteria, and diatoms; plant tissue culture; the preparation and properties of mutants; cellular and sub-cellular preparations from algae, bacteria, and plants; and the purification and properties of components of the photosynthetic systems."

All this is covered with amazing thoroughness in the sixty-nine component papers, each with its own bibliography. Many new questions are asked and answered, and the inevitable still newer ones recognized and often analyzed. The whole work is far removed from that which is simple, yet there is clarity in the authors' explanations that makes for reasonable comprehension.

The detailed author and subject indexes as well as the table of contents make access to the material facile. What a storehouse of information lies within the covers of this book!

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